A

DICTIONARY

OF

PRACTICAL MEDICINE.

VOL. III.—PART I.

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A

DICTIONARY

OF

PRACTICAL MEDICINE.

COMPRISING

GENERAL PATHOLOGY,

THE NATURE AND TREATMENT OF DISEASES,

MORBID STRUCTURES,

AND

THE DISORDERS ESPECIALLY INCIDENTAL TO CLIMATES, TO THE SEX, AND TO THE DIFFERENT EPOCHS OF LIFE.

WITH NUMEROUS

PRESCRIPTIONS FOR THE MEDICINES RECOMMENDED;

A CLASSIFICATION OF DISEASES ACCORDING TO PATHOLOGICAL PRINCIPLES;

A COPIOUS BIBLIOGRAPHY, WITH REFERENCES;

AND

AN APPENDIX OF APPROVED FORMULÆ.

THE WHOLE FORMING A LIBRARY OF PATHOLOGY AND PRACTICAL MEDICINE AND A DIGEST OF MEDICAL LITERATURE.

BY JAMES COPLAND, M.D., F.R.S.

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FOR DISEASES OF CHILDREN; ETC.

"Gladly wolde he lerne and gladly teche."—CHAUCER.

IN THREE VOLUMES.

VOL. III.—PART I.

LONDON
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"Read, and fear not thine own understanding; this book will create a clear one in thee; and when thou hast considered thy purchase, thou wilt call the price of it a charity to thyself."

SHIRLEY.

"One caveat, good reader, and then God speed thee! — Do not open it at adventures, and, by reading the broken pieces of two or three lines, judge it; but read it through, and then I beg no pardon if thou dislikest it. Farewell."

THOMAS ADAMS.

"Where there is much desire to learn, there will of necessity be much arguing, much writing, many opinions,—for opinions in good men are but knowledge in the making."

MILTON.

"Uti ratio sine experimentis mendax, ita experientia sine ratione fallax."

BRUNNER.

"Antequam de remediis statuatur, primum constare oportet, quis morbus et quæ morbi causa; alioquin inutilis opera inutile omne consilium."

BAGLIVI.

"It is the great excellence of a writer to put into his book as much as his book will hold."

S. JOHNSON.

"What dire necessities on every hand
Our art, our strength, our fortitude require!
Of foes intestine what a numerous band
Against this little throb of life conspire!
Yet Science can elude their fatal ire
Awhile, and turn aside Death's level'd dart,
Soothe the sharp pang, allay the fever's fire,
And brace the nerves once more, and cheer the heart,
And yet a few soft nights and balmy days impart."

BEATTIE.

"Go, little book, from this my solitude;
I cast thee on the waters,— go thy ways;
And if, as I believe, thy vein be good,
The world will find thee after many days."

SOUTHEY.

A DICTIONARY OF PRACTICAL MEDICINE.

PALATE.—Syn. *Palatum, P. molle et durum. Palais*, Fr. *Der Gaumen*, Germ. *Palato*, Ital. *The fauces.*

1. The mucous membrane covering the isthmus faucium—the soft palate and uvula—may be simply relaxed, or inflamed, or ulcerated. The hard palate—the bones of the palate may be also diseased,—may be inflamed or ulcerated and carious; but chiefly as a symptom of serious constitutional disease, especially of syphilis, more rarely of scurvy.

I. Relaxation of the Palate and Uvula. —*Relaxed throat—Relaxed sore throat—Catarrhal relaxation of the throat—Relaxation of the fauces.*

Classif.—I. Class. I. Order (*Author*).

Defin.—*Uneasiness or soreness in the fauces, often with slight cough, without fever.*

2. This affection occurs *primarily*; but it also attends catarrhal and other inflammations of the mucous membrane covering those parts and the tonsils and pharynx. It is also symptomatic of catarrhal affections, of chronic bronchitis, of the several states of indigestion, and of numerous other diseases. The anterior fauces or *velum palati* appears more or less relaxed, very humid or watery, with little or no increase, or only with slight increase of vascularity, and the uvula is *elongated*, and hangs down upon the base of the tongue, often reaching to the epiglottis, and is sometimes also *œdematous*. More or less uneasiness in the throat, somewhat increased on deglutition, and occasionally a dry, tickling cough, particularly when the relaxed uvula irritates the epiglottis, are complained of. Indeed the elongation of the uvula is generally the cause of the chief uneasiness attending relaxation of the palate or fauces, which often becomes a chronic disorder, especially in leucophlegmatic habits, and in persons who live irregularly and intemperately.

3. This affection, when it appears *primarily*, is generally *caused* by the same influences as produce inflammatory attacks of the palate or fauces (§ 6.), and catarrhal affections. It rarely continues limited to these parts, but extends to the adjoining surfaces—to the pharynx, epiglottis and larynx, causing a tickling cough, with slight mucous expectoration. It is frequent in spring and autumn, especially during humid states of the air, and usually, with relaxation or irritation of the Schneiderian membrane, constitutes a principal part of the common catarrhal affection. (See art. Catarrh, § 7.).

4. The *treatment* necessarily depends upon the causes of the affection, and upon the nature of the disorders of which it is symptomatic. If a part of, or connected with, the common *catarrh*, the treatment advised for that disorder (§§ 16. *et seq.*,) should be employed, and a warm embrocation may be applied to the neck or throat. If it be a symptom of indigestion, tonics and astringent gargles, after biliary and intestinal secretions are evacuated, are generally useful. In persons subject to dyspepsia, in those of a relaxed habit of body, and in the irregular liver, relaxation of the soft palate and uvula often becomes chronic, whatever means of cure may be prescribed, especially if the liver be at the same time torpid, or otherwise disordered. In those persons the elongation is often attended by œdema of the uvula, and is productive of the most unpleasant part of the symptoms. Amputation of the part has therefore been often recommended and too often allowed. Several persons who have had the uvula removed, have consulted me on account of disorders which had either continued or appeared after this part had been extirpated. The function of the uvula is evidently to convey the mucus and saliva over, and thereby to lubricate the base of the tongue and epiglottis; and when it is no longer, or is imperfectly discharged, not only those parts, but also the pharynx and glottis become the seat of a chronic irritation more serious than that caused by an elongation, which a judiciously directed treatment to the original source of disorder would remove.

5. If the elongation continue after such treatment, the hydrochloric or nitric acids, or both conjoined, may be given in the decoction of bark, or in syrup with a tonic tincture, and astringent gargles may be employed. If these fail, the uvula may be touched by a solution of the nitrate of silver, or by a powder containing the sulphate of alumina or sulphate of zinc.

II. Inflammation of the Palate.—Syn. *Palatitis, Isthmitis*, Hildenbrand. *Isthmitis simplex; Angina simplex; Cynanche simplex; Angina gutturalis; Angina mitis; Angor Faucium; Inflammatio Palati; Inflammatio Faucium*, Auct. Var. *Angine simple, Palatite*, Fr. *Die Rachenbraüne, Halsentzündung, Entzündung der Fauces*, Germ. *Sore-throat, Quinsey, Inflammatory Sore-throat. Inflammation of the Fauces.*

Classif.—III. Class. I. Order (*Author*).

Defin.—*Redness of the soft palate, generally with elongation of the uvula, pain on swallowing, and slight fever.*

6. i. The Causes of Palatitis are chiefly those

productive of CATARRH (§ 4. *et seq.*). The disorder is most prevalent in spring and autumn, in which seasons especially it is sometimes *epidemic*. It is an *endemic* in the vicinity of rivers, lakes, canals, and stagnant pools and marshes. It may affect all ages and both sexes; but it is more frequently observed in young persons and sanguine temperaments than in others. Cold and humidity, vicissitudes of temperature, weather and season, cold applied to the extremities, or currents of air passing over the face and neck, and exposure of the neck or throat, especially after having been overheated, or to the night-dews and fogs, are the most common causes, particularly of the catarrhal form of the complaint. The ingestion of too hot or too cold, or of acrid substances, and the abuse of spirituous liquors may also occasion inflammation of the fauces, in either its simple or its associated states.

7. Disordered states of the stomach and bowels, or accumulations of vitiated secretions in the biliary organs, or of excrementitious matters in the circulation, remarkably *predispose* to this affection. Palatitis, in either of its forms, is sometimes caused by, or is *symptomatic* of, disorder in these quarters, and it often attends, or ushers in, the eruptive fevers. Palatitis, in a *chronic*, *specific*, and generally *complicated form*, accompanies constitutional *syphilis*, and, in its *acute* and *diffused states*, it is frequently caused by the use of *mercurials*, especially if exposure to cold in any form concur to develope their effects.

8. ii. SYMPTOMS. — Inflammation is seldom confined to the soft palate, constituting the *simplest form of palatitis* or angina; but frequently extends more or less to the surfaces of adjoining parts, — to those of the tonsils and pharynx, and occasionally to those of the posterior nares, of the upper part of the œsophagus, and even of the glottis, although in a slighter degree. This is more especially the case in respect of catarrhal palatitis and in some epidemic visitations of the complaint.

9. *a*. The symptoms vary not only with the extent of surface that is affected, but with the constitution and habit of body of the patient, with the *character* of the affection, with the limitation of it to the mucous membrane, or with its extension to the sub-mucous cellular tissue. On inspection, the soft palate, — the velum and pillars of the fauces, are seen red and somewhat swollen. Slight heat, pain and uneasiness, with dryness at first, are complained of, and are increased on swallowing. The uvula is much elongated and hangs down upon the base of the tongue. There is generally a tickling or hawking cough from this cause, or from the extension of the inflammatory irritation to the lips of the glottis. There are often more or less mucous expectoration, and hoarseness of voice or speech. The tongue is loaded, and red at its point and edges. The pulse is accelerated, the bowels confined, and the appetite impaired. Chills and flushes continue to be felt, alternately, for two or three days. After the first or second day, a more abundant secretion of mucus takes place from the fauces and their vicinity, and in a few days more the complaint ceases.

10. *b*. Such is the usual course of the *simple* and more *mild palatitis*, particularly in its catarrhal form. But the inflammation often is more severe, and is attended by a lower or more *asthenic* fever, or it continues a longer period than that just stated. It may extend to or more immediately affect the Eustachian tubes, the pharynx, &c., and thus be complicated with pain in one or both ears, and deafness, or with pharyngitis, and even, although rarely, with œsophagitis, especially when the stomach and liver are much disordered. In some cases the inflammatory irritation, of a catarrhal or more phlegmonous character, subsides in the fauces, whilst it continues in the pharynx, occasioning painful or difficult deglutition, or even the forcible regurgitation of substances attempted to be swallowed, through the nostrils. The inflammatory or catarrhal irritation, however, more frequently extends to the glottis, and thence, in delicate persons, sometimes to the bronchi, occasioning cough, and catarrhal or slight, or even acute bronchitis; but in these cases the pharynx is generally mediately affected.

11. *c*. In other *complicated* instances, in addition to redness of the surface of the tonsils and fauces, the *tonsils* are enlarged, chiefly owing to effusion of lymph and serum under the mucous membrane in the connecting cellular tissue; and, in many cases, more or less tumefaction of the fauces is produced by the same cause. (See art. TONSILS.) When the disease is thus more deeply seated, more pain, uneasiness, and difficulty of swallowing are experienced, and the patient opens his mouth with an increase of pain. A copious secretion of mucus, mixed with a ropy saliva, takes place, and as this becomes less abundant and thicker, it sometimes also appears slightly puriform, especially in children. In these acute states, the symptomatic inflammatory fever is usually more fully developed; and, if they are *complicated* with inflammation of the tonsils, as they very frequently are, this fever assumes a highly inflammatory character, particularly in children and young persons.

12. *d*. In cold, humid, and low situations, seldom in sporadic or in few instances, more frequently in an epidemic form, the inflammation is, apparently, more confined to the mucous membrane of the palate and adjoining parts than in others, or in the common sporadic or more phlegmonous cases; and a greyish albuminous fluid is effused upon the inflamed surface, which immediately concretes into a false membrane. In this complication, the constitutional disturbance is extremely great, the powers of life often quickly sink, and the inflammation spreads rapidly over, if it does not simultaneously attack the mucous surface of the whole throat — of the soft palate, tonsils, pharynx, and even the Eustachian tubes, often extending also to the larynx and trachea, thereby inducing one of the forms of *croup*. (See art. CROUP, § 16.) In some cases, the inflammation spreads down the œsophagus also, particularly in children. (See art. THROAT.)

13. *e*. In the *thrush* and in other aphthous affections, the soft palate is implicated in common with the other parts of the throat and mouth, but this association of palatitis is fully considered in the article THRUSH. Palatitis, moreover, may supervene upon *erysipelas* of the face, and assume a very acute and diffuse character, the inflammation extending to the pharynx and larynx, and placing the patient in the most imminent danger.

14. *f*. The *chronic states* of palatitis differ from the simple and more common form, chiefly in the slighter grade and longer continuance of the

complaint. The surface appears irregularly red, or is reddened in patches, points, or striæ. Sometimes the vessels are more enlarged and conspicuous than usual; and the patches or points are of a more livid or dark hue. In some, dryness of the mouth and throat is complained of, and in others the mucous secretion is irregularly increased. This form of the complaint is generally prolonged by chronic disorder of the digestive organs, and by cachectic states of the system, or by constitutional disorder. Of the *specific forms* of inflammation of the palate, as the *acute form* caused by *mercury*, and the *chronic form* consequent upon the *syphilitic* infection, it is unnecessary to treat at this place. (See art. THROAT.)

15. *g*. The *duration* of the *acute states* of palatitis is seldom long: and generally *terminates* in a few days by resolution. These states seldom pass into *suppuration* unless they are very acute or phlegmonous, or are caused by some acrid or powerfully stimulating substance brought in contact with the palate and fauces. They rarely terminate in *gangrene*, unless in malignant *scarlatina*, and much more rarely in the membranous angina alluded to above (§ 12.) as occurring epidemically, especially in certain localities. (See art. THROAT.) I have observed this termination take place in two or three instances of erysipelas of the head and face, extending down the nostrils to the fauces. These cases occurred in persons addicted to spirituous liquors, whose liver and other digestive organs were much disordered.

16. *Ulceration* occurs chiefly in the more *chronic states* of the disorder, which are usually of long and very indefinite duration, owing to their dependence upon the constitutional maladies alluded to above (§ 14.), on which maladies, specific *inflammation* and *caries of the bones of the palate* may also supervene. Ulceration may occur also in the asthenic or more complicated and malignant states of acute inflammations of the throat, but not so frequently as it was formerly supposed to occur. (See art. THROAT.)

17. iii. The *Prognosis* of palatitis is commonly favourable, unless it assumes a very asthenic and complicated character, or extends to adjoining surfaces, owing to impaired vital energy, to disorder of the digestive and assimilating organs, or to contaminated states of the circulating fluids, in which circumstances it is apt to induce dangerous laryngitis. When it is associated with, or is symptomatic of, the diseases named above (§§ 14. 15.), the prognosis will altogether depend upon the nature of the primary malady, the state of the constitutional derangement, and the appearance of the local affection.

18. iv. TREATMENT.—*a*. There are few cases of palatitis which are not more or less benefited by an *emetic*, especially if its operation be duly promoted by diluents or the tepid or warm infusion of chamomile flowers, or if the affection be simple and mild, or caused by gastric or bilious disorder. The emetic should generally be followed by an active purgative and the warm pediluvium, a diaphoretic medicine being given at bed time, and continued as the presence of fever may suggest. These remedies, in the slighter cases, will generally remove the complaint; but, in the more acute, they may be insufficient, and general or local depletions may be also required, particularly when the patient is strong or plethoric, and the complaint complicated with tonsillitis. Antimonial diaphoretics, the solution of the acetate of ammonia, and the spirits of nitric æther will generally be of service in these cases; and, when *blood-letting*, general or local, has been resorted to, *sinapisms*, or *embrocations*, will be applied to the neck or throat with marked benefit. In the more acute or phlegmonous cases, particularly in robust and plethoric persons, the blood-letting will advantageously precede the emetic; and it should be also followed by a brisk cathartic, or a powder containing calomel and antimony, given at bed-time, and a purgative draught in the morning.

19. *b*. In this early or acute stage of the complaint, astringent or stimulating gargles are seldom beneficial; but the vapour of warm water impregnated with camphor, or the vapour of chamomile flowers and poppy-heads, or of an infusion of hops, &c., passed through the mouth, will often be of service.—Afterwards, warm gargles with small quantities of nitrate of potash, of the hydrochlorate of ammonia and camphor, will be of use.

20. *c*. After the acute symptoms have been removed, and relaxation of the parts, or a *chronic state* of *irritation* or *congestion* remains, *gargles*, containing the muriatic or sulphuric acid, or the sulphate of alumina, and one or more of the tinctures of myrrh, bark, capsicum, &c., will then prove beneficial. When the uvula is elongated, gargles, with the nitrate of silver, or a stronger solution of this salt, applied to the part by means of a small brush, or the applications already noticed (§ 5.), are then most efficacious. If an œdematous state of the palate continue after the acute stage has subsided, or if it have existed from the commencement, the terebinthinate embrocation (F. 311.) I have so frequently recommended, may be applied on warm flannel around the throat, or a blister may be applied on the back and sides of the neck.

21. *d*. If the inflammation proceed to *suppuration*, giving rise to a small abscess in the cellular tissue of the velum, &c., an early outlet should be given to the matter, and afterwards similar means to those already advised ought to be employed, or varied with the circumstances of the case, particularly the external applications mentioned above (§ 20.)

22. *e*. If the disease assumes the *asthenic* or diffused, or *complicated form* alluded to (§ 13.), or if membranous *exudations* form upon the inflamed surface, permanent stimulants and tonics, in the former case, and discutient and resolvent applications, in the latter, as fully shown in the article THROAT, are imperatively required, as the only means of preventing fatal sinking of the powers of life, in the one, and extension of the disease to the larynx and trachea, in the other. (See *arts.* CATARRH, CROUP, SCARLET FEVER, THROAT, THRUSH, and TONSILS, for important pathological connections of diseases of the palate.)

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PALPITATION. See art. HEART — *Functional Disorders of*.

PANCREAS.—SYN.— Παγκρεας (from παν, all, and κρεας, flesh), *Pancreas*, Fr.—*Gekrösdrüse*, *Pankreas*, Germ. *Pancreas*, Ital.

1. *The diseases of the Pancreas* have attracted but little attention, partly from the belief in their rare occurrence, and partly from the difficulty of recognising them during life.—The *functions* of this viscus have been rather inferred than demonstrated. The similarity of the *secretion* produced by the pancreas to saliva has been shown by MAGENDIE, TIEDEMANN, GMELIN, LASSAIGNE, LEURET, and others. But the pancreatic fluid contains no mucus, whilst saliva does. The former seems to contain a little free acid, the latter is nearly neutral. No analysis, however, of the pancreatic fluid from the human subject, has been furnished of sufficient accuracy to be confided in; and all we know respecting it is, that it resembles the saliva, but differs somewhat from it in chemical composition. The precise amount of function performed by the pancreas not having been ascertained, it has been supposed that the fluid secreted by it dilutes the chyme, and assists in the change of chyme into chyle. This office at least may be conceded to it; but it is not improbable, that it also aids in the complete conversion of chyle into blood, or in the formation of hæmatozine, as great emaciation and anæmia have been present in cases where chronic disease and obstruction of this viscus have been found after death. Drs. TIEDEMANN and GMELIN think that it assists in animalizing vegetable food not containing azote, as it contains a large quantity of highly azotised principles.

2. Formerly several diseases were considered to have their seat in the pancreas. FERNELIUS believed that this viscus was concerned in the production of diarrhœa, dysentery, cachexia, atrophy, languor, slow fevers, &c.; and RIOLANUS added to these, hypochondriasis and some other chronic disorders. MORGAGNI and PORTAL have adduced several instances of its change of structure; but some recent writers have made but little mention of its diseases. Although these diseases are seldom observed, and but rarely detected during life, owing to the want of precise knowledge of the functions of the organ, and to the situation and relations of it in respect of other organs, yet there are several reasons for inferring that they are more frequent than has been generally supposed. I shall, therefore, notice,—1st. Those *functional disorders* which may be imputed to the pancreas, although with much doubt and reservation;—2d. *Inflammations*, of it and the *consequences* they usually produce; —and 3d. Those *lesions of structure* not necessarily consequent upon inflammation.

I. FUNCTIONAL DISORDERS WHICH MAY BE IMPUTED CHIEFLY OR PARTLY TO THE PANCREAS.

CLASSIF.—I. CLASS. I. ORDER (*Author*).

DEFIN. *Alterations of the quantity or quality of the pancreatic fluid so as to disorder the functions of digestion or defæcation.*

3. Although I have inferred, that a material change in the quantity or quality of the pancreatic secretion will be productive of disorder of the stomach or bowels, still the exact characters of such disorders, and the differences subsisting between them and other disorders of these viscera, cannot be fully shown, or illustrated by satisfactory proofs.—*A. Deficiency of the pancreatic secretion*—*Torpor Pancreatis*—cannot be ascertained: although it very probably often occurs independently of organic lesion, and owing to impaired vital action of this gland. The extent of disorder, or the symptoms produced by this condition, hardly admit of remark; but it is not improbable, that indigestion, costiveness, flatulence, and many of the symptoms I have assigned to functional disorder of the *duodenum* (see art. DUODENUM, § 2. *et seq.*), may partly depend upon this state of function of the pancreas. Indeed, when the vascular and nervous connections of this organ, the duodenum, the liver, and of the stomach are considered, it will be admitted that impaired energy of one or more of them will readily extend itself to the others. Emaciation, anæmia, or imperfect sanguification and assimilation, in any of their grades, may not improbably partly depend upon this state of function. In the experiments by BRUNNER of extirpating the pancreas, the alvine evacuations became scanty and indurated; and, although but little reliance can be placed upon the results of so violent an operation as this, still they correspond with rational inferences.

4. *B. Increased secretion of the pancreatic fluid, with or without change of its qualities or properties*, may take place, independently of structural lesion of, although hardly without vascular determination to, this organ. Analogy supports this inference, although demonstration of the fact cannot be adduced; and it may, upon the same evidence, be admitted, that some agents will have the effect of increasing this fluid, although the proofs of such an effect may be disputed. In some cases of diarrhœa, the stools present appearances so closely resembling those of the salivary and pancreatic fluids, that it is not unreasonable to infer, that they consist, at least in part, of an increased flow of the latter fluid. But when diarrhœa follows the suppression or disappearance of salivation, the stools presenting these appearances, the inference as to its nature and origin—as to its being actually a form of *pancreatorrhœa*—is still more conclusive. In those cases, also, where watery and ropy evacuations have followed the exhibition of chologogue purgatives, with the view of removing dropsical effusion, it is not unreasonable to suppose, that a portion of these evacuations has consisted of an increased flow of pancreatic fluid.

5. Since I commenced lecturing in 1825, I have argued, that the discharge from the stomach in PYROSIS (*see that article*), chiefly consisted of an augmented, and probably also of a somewhat altered pancreatic secretion,—that this secretion, owing to its properties or its quantity, or to both, had been regurgitated into the stomach, and that its accumulation there had occasioned pain and

irritation, followed by its rejection. Thus I have viewed pyrosis as being more correctly a form of *pancreatorrhœa*, and have considered that alteration of the quality of the fluid has caused its ejection upwards, instead of its passage through the bowels. More recently, MM. MONDIÈRE and GUERSENT have espoused nearly the same view of the origin of pyrosis, ascribing it to the irritating quality of the pancreatic fluid. It should not be overlooked, also, that WEDEKIND and PORTAL ascribed chronic diarrhœa and dysentery, with watery, colourless, or ropy discharges, chiefly to a morbidly increased secretion from the pancreas. But DUPUYTREN went still further when he believed that the enormously abundant discharges in epidemic cholera proceeded from this viscus.

II. INFLAMMATION ON THE PANCREAS.—SYN. *Pancreatitis, Inflammatio pancreatis.—Pancreatite*, Fr. *Gekröesdrusenentzündung*, Germ.

CLASSIF.—III. CLASS. I. ORDER (*Author*).

DEFIN.—*Deep-seated pain, somewhat below the pit of the stomach, or between this part and the umbilicus, extending to the back and under the left shoulder-blade; occasional vomiting of an albuminous and ropy fluid, great thirst, and symptomatic fever.*

6. The pancreas may, like other organs, be inflamed either in an *acute, sub-acute*, or *chronic form*. It is doubtful whether or not the second and third of these states, owing to the comparative mildness of the disease, and the frequent association of it with inflammation of adjoining parts, can be certainly detected during life—most probably only in a small proportion of instances; and it is not improbable, that enlargement and induration of the organ are consequences of one or other of these states of inflammation, more particularly of the chronic. It has been doubted by MM. BÉCOUR and MONDIÈRE, whether *acute, sub-acute*, or *chronic* pancreatitis is of most frequent occurrence, but the point hardly admits of solution, nor is it of much practical importance.

7. i. SYMPTOMS.—*a*. The phenomena attending the *acute* state of pancreatitis are chiefly dull, gravative, or even acute and deep-seated pain a little below the pit of the stomach, extending to the back and below the left shoulder-blade, increased by bending the body forwards, and but little affected by pressure; a sense of constriction or of anxiety at the præcordia, and an unusual dryness of the fauces and thirst, with more or less symptomatic fever. There are other symptoms which are less constantly observed than the above; and there are some which occur more frequently in the course of the *sub-acute* and *chronic* states of the complaint than in that of the acute. Occasionally, a painful feeling of heat is complained of at the epigastrium, and sometimes a sense of tension in this region. There is every reason to infer, that the pancreas is greatly tumefied when it is inflamed in either of the forms just mentioned, and hence jaundice, owing to the pressure of the tumefied gland upon the common bile-duct, may be expected sometimes to occur. In some cases, also, more or less tumour has been detected between the scrobiculus cordis and umbilicus; the tumour being hard, painful, deeply seated, and distinct from the liver and stomach. Occasionally there is a discharge of a ropy fluid from the stomach without retching, or even without nausea or anorexia; and, in other cases, both nausea and vomiting occur, a ropy mucous fluid, of a whitish-grey colour, occasionally tinged with bile, being thrown up. Sometimes a more copious flow of saliva than usual takes place. The state of the bowels varies. When a ropy fluid is discharged upwards, the bowels are generally confined; but occasionally a mucous diarrhœa, or loose ropy stools are observed.

8. *b*. The more *chronic states* of pancreatitis are recognised with difficulty. Many of the symptoms above detailed are present in a slighter or less manifest form; but several of them, particularly the pain, sense of tension, and heat, are either felt only after a meal, or are aggravated by it. In addition to these, flatulence, acrid eructations, or pyrosis, various dyspeptic symptoms, and pain or uneasiness in the back, are complained of. According to HEINECKEN, EYTING, MONDIÈRE, FALLAT, and others, some degree of tumour, or fulness may be detected in the epigastrium; and a ropy mucus, resembling saliva, is generally vomited every morning; or, when this is not observed, regular attacks of pyrosis occur, or evacuations from the bowels of matters partly resembling those which have been brought up by the œsophagus. In a few instances salivation has alternated with the above symptoms.

9. One question suggests itself, viz. whether the augmented pancreatic secretion attends the acute, sub-acute, or chronic states of the disease? An increased discharge of this fluid appears often in connection with inflammation of the gland; but whether it is antecedent to, coetaneous with, or consequent upon, the inflammation, has not been determined. It is not unlikely, that the most acute states of the disease, when the substance of the gland is the seat of the inflammation, are not attended by an augmented, but rather by a diminished secretion of the pancreatic fluid.

10. *c*. The *complications* of pancreatitis generally obscure, or altogether conceal, the disease of this viscus. Indeed, even when pancreatitis is the primary complaint, the inflammation may soon extend to the duodenum, or to the stomach, or to the liver, or to the root of the mesentery, or even to any two of these viscera; but probably the pancreas is more frequently affected consecutively of inflammation of one or other of these organs, than primarily. The *symptoms* attending these complications have not been satisfactorily observed; but they may be inferred to consist of an association of many of the above symptoms (§ 7.) with the phenomena characterising inflammation of either of those viscera complicated with pancreatitis.

11. *d*. The *Terminations* and *Consequences* of pancreatitis are, 1st. Resolution; 2d. The effusion of coagulable lymph upon the surface of the organ; 3d. Suppuration; 4th. Gangrene; and 5th. Chronic enlargement and induration.

12. (*a*.) HARLES supposed that a copious sweat or diarrhœa is critical in pancreatitis, especially if the latter present a ropy or mucous character; but facts are wanting to prove these points. It is, however, not unlikely that the complaint is resolved in the milder cases by a copious secretion, causing more or less diarrhœa, or even vomiting or pyrosis, without the symp-

toms having been so prominent as to lead to the detection of the antecedent pancreatitis.

13. (*b.*) The *effusion of coagulable lymph* upon the external surface of the pancreas, gives rise either to a false membrane, or to adhesion of it, owing to the extension of inflammation to the external surface of an adjoining viscus, as the duodenum, pylorus, stomach, liver, spleen, mesocolon. These adhesions vary in thickness and form with their situation, age, organisation, &c.

14. (*c.*) *Suppuration* has been noticed by LIEUTAUD, HARLES, BAILLIE, PORTAL, MOULON, BÉCOURT, and others; but it has been most accurately described by M. GENDRIN, who states that it generally commences with infiltration of the interlobular tissue of the part of the organ affected. The glandular granules are soft, of a reddish grey colour, and diminished in size, although the organ is enlarged. The capsule is much inflamed, and sometimes thickened by the formation of a false membrane. At an advanced period of suppuration the matter is collected in one cavity, generally of moderate size. The pus is occasionally intermixed with the pancreatic fluid, which exhibits a clear yellowish appearance. In some cases, the abscess is so large as to destroy the whole substance of the organ. In these cases M. GENDRIN describes the matter as inodorous and creamy; but PORTAL states that it is sometimes very offensive.

15. Pancreatic abscess may be *discharged* either into the stomach, or into the duodenum. It may pass even into the duplicature of the mesocolon, where it may be retained, or whence it may pass into the peritoneal cavity. It may even pass along the duct into the intestines, and be evacuated by stool. A case communicated by Dr. HAYGARTH to Dr. PERCIVAL seems to have been of this kind.

16. *Secondary abscesses*, or collections of matter after phlebitis, or consequent upon the absorption of matter in situations more or less remote, have been found in the pancreas in post-mortem examinations, but not so frequently in this viscus as in some others, as the liver, lungs, &c. They have been found chiefly after puerperal or uterine phlebitis, and after phlebitis consequent upon extirpation of the testicle. The occurrence of abscess in the pancreas, after extirpation of the testis, was first remarked by A. PETIT and PORTAL; but its actual dependence upon inflammation of the veins after the operation was not known until more recently.

17. The *symptoms* indicating suppuration of the pancreas have not been precisely observed; but they probably differ in few respects from those attending suppuration in other internal parts, which is usually insidious and obscure. If an abscess of considerable size should form, so as to occasion a tumour, the situation of it may assist in indicating its nature; but, if it should cause jaundice by pressing on the common duct, it might be mistaken for tumour in the liver, or for an overdistended gall-bladder, from occlusion of the common bile-duct, which latter generally attends enlargement or tumour of the pancreas of any kind.

18. (*c.*) *Gangrene* has been very rarely observed in this organ. Two cases of it have been recorded by M. BÉCOURT, and one by M. PORTAL. In one of these, the patient had been subject to occasional colicky pains, which were deeply seated above the umbilicus, and were sometimes preceded, at other times followed, by nausea or by diarrhœa. He became emaciated, the pains were more acute, and the pulse rapid. The heat of the skin assumed an acrid or morbid character; the abdomen became tender; the urine scanty and red; and death followed a few days afterwards. The pancreas was found of a livid-red hue, very much softened, exuding from its whole surface a blackish, fœtid fluid, and gangrened almost throughout its extent. The stomach and duodenum were inflamed.

19. (*d.*) *Enlargement* and *Induration* of the pancreas are probably also consequences of chronic inflammatory action, or irritation; or of prolonged excitement, followed by a change of the nutrition, of the organ; but more particular notice will be taken of these lesions in the sequel (§ 25.)

20. ii. *The* CAUSES *of Pancreatitis* are not fully ascertained. Many foreign writers consider the abuse of mercury to be the most frequent cause of it; and, next to mercury, HILDENBRAND views the use of tobacco, particularly the smoking and chewing of this noxious herb, as most influential. The immoderate use of spirituous liquors; a frequent recourse to purgatives; falls, blows, and other external injuries; and the extension of inflammation from adjoining organs, are probably also causes of this disease. Pancreatitis may even occur sympathetically of inflammation of the salivary glands. M. ANDRAL found the pancreas greatly injected in a patient who died of fever with enlargement of the parotids. M. MONDIÈRE refers to a case in which these glands were remarkably enlarged. The enlargement disappeared rapidly, but was followed by symptoms of disease of the pancreas; and this disease, in its turn, was superseded by inflammation of the testicle. The enlargement of the parotid again appeared, the affection of the testicle subsided; and the application of a blister upon the parotid fixed the inflammation in this latter part, suppuration being the result. I have met with several cases in which inflammation, in a sub-acute or chronic form, seemed to exist in the pancreas, but chiefly in pale and debilitated persons, who had complained of prolonged disorder of the digestive organs. Only one opportunity, however, was afforded me of verifying the diagnosis by an examination after death; and in that case, the pancreas was very much enlarged and somewhat indurated. The following case recorded by Dr. SCHMACKPFEFFER will illustrate the history of acute pancreatitis:—

21. A female, twenty-nine years of age, contracted syphilis, for which she was treated by means of corrosive sublimate. Violent ptyalism took place, four pounds of saliva being excreted in the twenty-four hours. As this secretion diminished, diarrhœa appeared and increased. Soon afterwards the patient complained of anxiety and heat, with a fixed, obtuse, and deep-seated pain, at the epigastrium; of loss of appetite, nausea, tension of the abdomen; of great thirst and dryness of the throat; and rapid pulse. These symptoms were aggravated when the stomach was full. During five days, some amelioration was remarked, but bilious vomiting supervened and the pain and diarrhœa increased. The frequency of

the calls to stool became remarkably great; a watery yellowish fluid resembling saliva being voided. The deep-seated pain above the umbilicus prevented the patient from lying on her back and left side; and was increased by a full inspiration. Some days of relief followed, after which a violent increase of fever appeared, with a return of the diarrhœa, an acute pain at the epigastrium, and cough and orthopnœa. Bloodletting was prescribed. The following morning the parotids were hot and painful; the mouth was burning, the pulse small, and the stools were suppressed. Mercury, camphor, and opium were ordered, and leeches, blisters, &c., to the parotids. Towards evening, the breathing became stertorous, the anxiety extreme, the pulse thready and intermittent, the extremities cold, and the face Hippocratic. She expired in the night. The pancreas was found red, swollen, and somewhat more consistent than natural. It weighed eight ounces; and blood ran freely from it upon dividing it. The duct was dilated. The parotids were also inflamed.

22. iii. *The* TREATMENT of pancreatitis differs but little from that of other inflammations of an acute and sthenic character. General or local bloodletting, or both, according to the state of the pulse and vascular system generally, and to the condition of the patient; warm baths, fomentations, and diluents; cooling diaphoretics and sedatives, are the most appropriate means. If diarrhœa be present, it merely should be moderated, by absorbents and opiates, or small doses of Dover's powder; and the circulation determined to the surface of the body by promoting a copious perspiration. A large blister, sinapisms, or warm turpentine embrocations, placed over the epigastrium, will generally alleviate the deep-seated pains, as well as the vomiting, when these symptoms are present. If the disease appears to have passed into a *chronic state*, these external derivatives may be rendered more permanent by repetition, or by procuring a discharge from the blistered or inflamed surface; and, if indications of suppuration of the gland occur, the constitutional powers should be supported, and absorption promoted by prescribing the iodide of potassium, and liquor potassæ with sarsaparilla and tonic vegetable infusions or decoctions; a discharge from the external surface being also procured. The pale and anæmial state of some patients in whom I have had reason to suspect the existence of inflammation of the pancreas, seems to contra-indicate the propriety of general, and even of local bloodletting, and to suggest very different, if not opposite means of cure; and in a very few instances I have prescribed the sulphate of iron with camphor and opium; sulphate of quinine with camphor and hyoscyamus, or conium, or extract of hops; the trisnitrate of bismuth with ipecacuanha and either of these narcotics, and similar medicines with marked benefit; but more or less doubt existed as to the exact seat and nature of the malady.

III. STRUCTURAL LESIONS OF THE PANCREAS NOT NECESSARILY DEPENDENT ON INFLAMMATION.

CLASSIF.—IV. CLASS. I. ORDER (*Author*).

23. The *organic lesions* of the pancreas, as those of other organs, have been chiefly referred to diseased nutrition, when they appear to differ from the more obvious consequences of inflammation. Still this diseased nutrition, varying as it does in character, form, and results, must itself depend upon some pre-existing morbid state or states, originating either in the organic nerves of the part, or in the capillary vessels, or in the secreting apparatus of the part, or in these collectively — in the vitality, in short, of the organ. Modern pathologists, in grappling with this and several other subjects which have long been matters of discussion, have had recourse to new names and terms, believing that they afford explanations, even if they do not actually constitute discoveries. But the reader will soon be enabled to estimate the true value of terms or epithets when he reflects upon their meaning, and their applicability to visible phenomena and changes,—to deviations from the healthy condition, which are never stationary or exactly identical with one another, but varied in form, character, appearances, associations, morbid relations and results, to an extent that precludes the possibility of description; and he will readily detect what portion of sense and precise information may be concealed beneath the rubbish of phraseology, and the affected use of novel terms. Still terms and names of some kind are conventionalities that must be resorted to, in order to convey accurate ideas of certain morbid conditions, and their probable results; but these should not be multiplied beyond the necessity of the occasion; nor be used when generally received and well understood words are altogether applicable.

24. i. *Atrophy* or *wasting* of the pancreas sometimes occurs, according to SIEBOLD and LOBSTEIN at an advanced age. It is occasionally also the result of disease, either of itself or of adjoining organs. Dr. LOBSTEIN records an instance of the pancreas being atrophied and somewhat indurated, independently of lesion of any other organ. Most frequently, however, the wasting is connected with organic disease of the liver, duodenum, stomach, or of the mesenteric glands or consequent upon tumours developed in its vicinity, as scirrhous enlargement of the pylorus, aneurisms of the aorta, &c. Dr. HULL found the pancreas wasted owing to the pressure caused by a scirrhous tumour in the mesentery. M. GUERIN observed this lesion produced by a similar cause; MORGAGNI by a tumour in the liver; M. BERJAUD by aneurism in the aorta; and M. MONDIÈRE by scirrhous pylorus. In this last case, it is supposed that the atrophy of the pancreas is the result rather of interrupted or diminished function, owing to the small quantity of chyme passed into the duodenum, than of any pressure produced by the thickened pylorus. M. DARCY has adduced a case of *rabies*, in which the pancreas was remarkably small. In a case recorded by Dr. WOLF of a person who had complained of nausea, vomitings of bilious and mucous fluids, of a burning sensation along the œsophagus, of alternations of constipation and diarrhœa, and ultimately of excessive emaciation, the pancreas was found very small, indurated, of a greyish colour; its arteries being ossified, and its duct obstructed.

25. ii. *Hypertrophy* or *enlargement* is the most frequent lesion observed in the pancreas; but it is rarely seen without some change in the structure of the organ. Chronic inflammatory action, and the consequent deposition of albuminous

lymph in the areolar or cellular tissue, especially the interlobular tissue, this lymph having become more dense by the absorption of its more fluid parts, and ultimately partially organised, are probably the changes constituting a large proportion of the cases of enlargement of this organ, and these in a more advanced and indurated state, have not unlikely been mistaken for, and described as, scirrhus of the organ, by several writers who have recorded instances of scirrhous tumour in this situation. It is even not improbable, that obstruction of the pancreatic duct may be followed by a form of enlargement which has not been accurately described. An out-patient of the South London Dispensary, under my care, in June, 1821, had complained of fever, pain below the epigastrium, of nausea, vomitings, thirst, emaciation, &c. She was pale, debilitated, and ultimately deeply jaundiced. A manifest tumour was detected in the lower part of the epigastrium. The body was examined after death by myself and Mr. Bryant, my colleague. The gall-bladder was distended by thick black bile, the common and pancreatic ducts were entirely obliterated by a remarkably enlarged and indurated pancreas. Upon examining the structure of this organ more minutely, it seemed as if the glandular structure was more dense than natural; the connecting cellular tissue was infiltrated with albuminous lymph, which had become condensed by the absorption of its more fluid parts, and the ramifications of the ducts were dilated and filled with the albuminous and more consistent constituents of the pancreatic secretion, the more watery portion having apparently been absorbed.

26. It is not unlikely that these more simple changes, giving rise to enlargement of the organ, whether consequent upon chronic inflammation or upon obstruction to the discharge of the pancreatic fluid, may be followed by other important changes, several of those about to be noticed actually originating in these. The infiltration of an albuminous fluid or lymph into the connecting cellular tissue; the subsequent organisation, partially or fully, of this, and the growth of it afterwards as the organisation of it becomes more perfect; the changes produced by it from pressure or otherwise, upon the natural structure and secreting apparatus; and the alterations of organic nervous influence, of vascular action and nutrition, of which the organ is subsequently the seat, may reasonably be viewed as not altogether an insufficient explanation of several of the changes and transformations observed in this and other glandular structures. Several interesting cases and notices of enlargement of the pancreas have been recorded by Sewall, Crampton, Gregory, Abercrombie, Bécourt, Bedingfield, and others referred to in the *Bibliography*.

27. iii. *Softening* of the pancreas, as well as enlargement, may result from acute inflammation; but it has been observed chiefly in scorbutic and scrofulous persons. M. Portal found this organ remarkably softened, without being either reddened or enlarged, in two children who died in measles. This change has been also remarked in fatal cases of confluent small pox, and of malignant scarlet fever. I have observed it in malignant remittent fever and in scurvy, but only in common with softening of several other organs, as the spleen, &c. I am not aware of any instance having been recorded of *hæmorrhage* into the substance of the pancreas, independently of *wounds* or *rupture* of the organ.

28. iv. *Induration* of the pancreas may exist independently of scirrhosity, and it is extremely doubtful whether or not simple induration is the commencement of scirrhus, as supposed by some writers. Some degree of induration sometimes exists with hypertrophy; but, in simple induration of the glandular granules of the organ, increased bulk is rarely observed, the connecting cellular tissue being neither thickened nor indurated, as in cases minutely described by MM. Mondière and Bécourt, in which the granules only were remarkably indurated, the connecting cellular tissue being sound. The subject of one of these cases died of chronic duodenitis. In incipient scirrhus a portion only of the organ is affected, and the cellular tissue is either primarily attacked or early implicated. Although simple induration of the pancreas is thus independent of, yet it is sometimes associated with hypertrophy, as in the case already noticed, and in another which was more recently observed, in neither of which nor in the two cases described by Dr. Sewall, did the disease present a scirrhous character.

29. v. *Cartilaginous induration* or *transformation* of the pancreas was met with by Morgagni, Andry and Lilienhain, who have described the organ as somewhat enlarged, its surface irregular, and its substance of a cartilaginous consistence. This change was found in persons who long experienced nausea, vomitings, thirst, pain at the epigastrium, costiveness, &c., and was probably the remote consequence of chronic inflammation.

30. vi. *Concretions* similar to those found in the salivary glands and ducts, have been met with in the pancreas in rare cases. These are either small and numerous, or few and large. In some instances, they are found apparently in the substance of the organ, but probably formed in the ramifications of the ducts; but more frequently they are lodged in the excretory duct. Graeffe found seven of the size of peas in the right portion of the gland. Galeali found about twenty contained in a cavity the size of a hen's egg, in the head of the viscus. Portal met with a dozen, some of which were as large as a nut. The gland was greatly enlarged, and the duct much dilated. The concretions were rounded, whitish, and when reduced to a powder, were dissolved by boiling water. They had an insipid taste. Merklin found a concretion as large as an almond; and Meckel states that he has seen the organ changed to an almost tophaceous mass. Those commonly found in the excretory duct are often large, about the size of a nut, and composed of the carbonate or phosphate of lime. They are generally whitish, and their surfaces irregular. By obstructing the duct, they occasion swelling and enlargement of the gland. The salivary secretion continuing for a time after the obstruction, the ramifications of the obstructed duct are distended by this fluid, which becomes inspissated by absorption of the watery parts of it, and thus a form of enlargement already noticed (§ 25.), is produced.

31. vii. *Tubercular formations* have been seen in the pancreas by several modern pathologists, and have been fully described by Nasse, Bouillaud, Reynaud, Mitivie, Harles, and Bécourt. They

appear to have been attended by hectic fever, emaciation, occasional salivation and diarrhœa, and by pain at the epigastrium or a little below it; and to have existed chiefly in the first and second stages of developement.

32. viii. *Transformation of the pancreas into a fatty substance*, has been observed by MM. Dupuytren, Lobstein, and Becourt. This lesion is different from, and should not be confounded with, an accumulation of fat in the cellular tissue uniting the lobes and lobules. The change may affect either a part or the whole of the organ, as in the cases observed by the writers just cited. The symptoms remarked in those cases were a sense of oppression at the epigastrium, pain between the umbilicus and pit of the stomach, constant cardialgia, salivation, and jaundice.

33. ix. *Cysts* have been found in this organ by Morgagni, and M. Becourt has described a preparation in the museum of the medical school at Strasburg, of a cyst of a very large size in the body of the viscus.

34. x. *Scirrhus and carcinoma* of the pancreas have been observed by most of the writers referred to in the *Bibliography;* but many of the cases adduced as scirrhus have been more correctly instances of enlargement with induration. True scirrhus generally affects, or commences in, a part only of the organ; but it may extend to the whole. This malady appears to attack the pancreas primarily in a large proportion of cases, as it alone has been found affected; although, in others, it has also been found in other parts. In a few cases the pancreas only is diseased; but in the great majority, lesions of some kind — non-malignant or malignant — slight or extensive — are also observed in other, most frequently in adjoining organs, particularly the duodenum, the stomach, the pylorus, the liver, the spleen, the mesentery, the adjoining or connected ducts, blood-vessels, &c., or any two or more of these or other viscera. Scirrhus of the pancreas may exist without any increase of size. Most frequently, however, the bulk of the organ is more or less, or even very remarkably enlarged. The scirrhous pancreas sometimes adheres to one or more adjoining organs or parts; most frequently when the scirrhus has gone on to *ulceration* — a result not frequently remarked, probably owing to the circumstance of scirrhus, and the lesions associated with it in other organs usually terminating fatally before ulceration commences. Cases, however, of open cancer of the pancreas have been recorded by Hasenoehrl, Bertheau, Mattheis, Mabille, Van Doeveren, Lerminier, Portal, and Vidal. Scirrhous enlargement of the pancreas is generally attended by very obstinate vomiting, particularly when the pylorus or duodenum is much pressed upon, or constricted by it; and by acute pain in the back. Instances not only of constriction of these and of the common bile-duct, causing deep jaundice, but also of compression of the aorta, by this lesion of the pancreas, have been recorded by Rahn, Portal, Salmade, and Brière de Boismont. The compression and constriction of the aorta may even occasion aneurismal dilatation above the seat of constriction, as seen by Portal and Salmade.

35. xi. *Fungo-Hæmatoid disease* has been found in the pancreas in three cases by Dr. Abercrombie, and in single instances by Dr. Bright and others. I found this lesion in the pancreas of a boy about fourteen years of age. Several other organs were also the seat of this malady.

36. xii. *Melanosis* has been found in a few cases: but this disease has not been accurately observed and described, as it affects the pancreas.

37. xiii. *The symptoms of organic lesions of the pancreas* are often very obscure: and although it may be inferred, from the grouping of morbid phenomena, that the pancreas is the seat of disease, the exact nature of that disease, or the extent of lesion of other organs associated with it, can rarely be recognised during life. The symptoms which are most frequently observed, although not constantly, are cardialgia, nausea, vomiting, and other disorders of the stomach; pain at the lower part of the epigastrium; tumour in the same situation; salivation; diarrhœa, or constipation; emaciation; and jaundice.

38. (*a.*) *Cardialgia* and other symptoms of severe indigestion had been early remarked in all the cases of organic lesion of the pancreas which I have had an opportunity of observing. The appetite at this early period was not usually impaired. It was even increased, in some cases. Thirst was often complained of at an early stage, but not so much as in the acute state of disease. To these symptoms generally succeeded *nausea* or *vomiting*, either occasionally or at intervals. At first, only eructations of a ropy fluid occurred; but subsequently vomitings, two or three hours after a meal, supervened. As the disease proceeded to a fatal issue, the vomiting was more frequent and obstinate.

39. (*b.*) *Pain*, deep-seated in the lower part of the epigastrium, with a sense of heat, was also an early symptom, and was most complained of when the stomach was empty. It was aggravated at intervals, especially by flatulence, which frequently attended it, and was relieved for a time by eructations, which sometimes were attended by a discharge of a ropy fluid, sometimes insipid, at others acid. The pain usually extended to the spine, and to either hypochondrium. It seems to have been most severe in the cancerous cases, as in that described by M. Andral, in which it was very acute, and seated chiefly in the back, whence it irradiated to the chest and abdomen. In some instances, as observed by Dr. Sewall and others, it was increased by the vertical position, the patient generally bending forward to obtain relief. In order to ascertain the exact seat of pain, and to distinguish between disease of the pancreas and that of the pylorus, the epigastrium should be examined or pressed upon at the same time that the left hand presses firmly against the back. When the pylorus is affected the pain is felt more superficially, chiefly to the right of the epigastrium, is more aggravated by pressure than in disease of the pancreas, and is more relieved by vomiting; but disease of both parts is often associated.

40. (*c.*) *Tumefaction* between the pit of the stomach and the umbilicus was found deep-seated, in the more emaciated subjects, when there was considerable enlargement of the organ. The tumour was generally, at first, very difficult to detect. When this is the case, the examination should be made in the manner just now directed.

lymph in the areolar or cellular tissue, especially the interlobular tissue, this lymph having become more dense by the absorption of its more fluid parts, and ultimately partially organised, are probably the changes constituting a large proportion of the cases of enlargement of this organ, and these in a more advanced and indurated state, have not unlikely been mistaken for, and described as, scirrhus of the organ, by several writers who have recorded instances of scirrhous tumour in this situation. It is even not improbable, that obstruction of the pancreatic duct may be followed by a form of enlargement which has not been accurately described. An out-patient of the South London Dispensary, under my care, in June, 1821, had complained of fever, pain below the epigastrium, of nausea, vomitings, thirst, emaciation, &c. She was pale, debilitated, and ultimately deeply jaundiced. A manifest tumour was detected in the lower part of the epigastrium. The body was examined after death by myself and Mr. Bryant, my colleague. The gall-bladder was distended by thick black bile, the common and pancreatic ducts were entirely obliterated by a remarkably enlarged and indurated pancreas. Upon examining the structure of this organ more minutely, it seemed as if the glandular structure was more dense than natural; the connecting cellular tissue was infiltrated with albuminous lymph, which had become condensed by the absorption of its more fluid parts, and the ramifications of the ducts were dilated and filled with the albuminous and more consistent constituents of the pancreatic secretion, the more watery portion having apparently been absorbed.

26. It is not unlikely that these more simple changes, giving rise to enlargement of the organ, whether consequent upon chronic inflammation or upon obstruction to the discharge of the pancreatic fluid, may be followed by other important changes, several of those about to be noticed actually originating in these. The infiltration of an albuminous fluid or lymph into the connecting cellular tissue; the subsequent organisation, partially or fully, of this, and the growth of it afterwards as the organisation of it becomes more perfect; the changes produced by it from pressure or otherwise, upon the natural structure and secreting apparatus; and the alterations of organic nervous influence, of vascular action and nutrition, of which the organ is subsequently the seat, may reasonably be viewed as not altogether an insufficient explanation of several of the changes and transformations observed in this and other glandular structures. Several interesting cases and notices of enlargement of the pancreas have been recorded by Sewall, Crampton, Gregory, Abercrombie, Bécourt, Bedingfield, and others referred to in the *Bibliography*.

27. iii. *Softening* of the pancreas, as well as enlargement, may result from acute inflammation; but it has been observed chiefly in scorbutic and scrofulous persons. M. Portal found this organ remarkably softened, without being either reddened or enlarged, in two children who died in measles. This change has been also remarked in fatal cases of confluent small pox, and of malignant scarlet fever. I have observed it in malignant remittent fever and in scurvy, but only in common with softening of several other organs, as the spleen, &c. I am not aware of any instance having been recorded of *hæmorrhage* into the substance of the pancreas, independently of *wounds* or *rupture* of the organ.

28. iv. *Induration* of the pancreas may exist independently of scirrhosity, and it is extremely doubtful whether or not simple induration is the commencement of scirrhus, as supposed by some writers. Some degree of induration sometimes exists with hypertrophy; but, in simple induration of the glandular granules of the organ, increased bulk is rarely observed, the connecting cellular tissue being neither thickened nor indurated, as in cases minutely described by MM. Mondière and Bécourt, in which the granules only were remarkably indurated, the connecting cellular tissue being sound. The subject of one of these cases died of chronic duodenitis. In incipient scirrhus a portion only of the organ is affected, and the cellular tissue is either primarily attacked or early implicated. Although simple induration of the pancreas is thus independent of, yet it is sometimes associated with hypertrophy, as in the case already noticed, and in another which was more recently observed, in neither of which nor in the two cases described by Dr. Sewall, did the disease present a scirrhous character.

29. v. *Cartilaginous induration* or *transformation* of the pancreas was met with by Morgagni, Andry and Lilienhain, who have described the organ as somewhat enlarged, its surface irregular, and its substance of a cartilaginous consistence. This change was found in persons who long experienced nausea, vomitings, thirst, pain at the epigastrium, costiveness, &c., and was probably the remote consequence of chronic inflammation.

30. vi. *Concretions* similar to those found in the salivary glands and ducts, have been met with in the pancreas in rare cases. These are either small and numerous, or few and large. In some instances, they are found apparently in the substance of the organ, but probably formed in the ramifications of the ducts; but more frequently they are lodged in the excretory duct. Graeffe found seven of the size of peas in the right portion of the gland. Galeali found about twenty contained in a cavity the size of a hen's egg, in the head of the viscus. Portal met with a dozen, some of which were as large as a nut. The gland was greatly enlarged, and the duct much dilated. The concretions were rounded, whitish, and when reduced to a powder, were dissolved by boiling water. They had an insipid taste. Merklin found a concretion as large as an almond; and Meckel states that he has seen the organ changed to an almost tophaceous mass. Those commonly found in the excretory duct are often large, about the size of a nut, and composed of the carbonate or phosphate of lime. They are generally whitish, and their surfaces irregular. By obstructing the duct, they occasion swelling and enlargement of the gland. The salivary secretion continuing for a time after the obstruction, the ramifications of the obstructed duct are distended by this fluid, which becomes inspissated by absorption of the watery parts of it, and thus a form of enlargement already noticed (§ 25.), is produced.

31. vii. *Tubercular formations* have been seen in the pancreas by several modern pathologists, and have been fully described by Nasse, Bouillaud, Reynaud, Mitivie, Harles, and Bécourt. They

fig. Strasb. 1830.—*Carter*, Cyclop. of Pract. Med. vol. iii. p. 237.—*Jolly*, Dict. de Med. et Chirurg. Prat. t. xii.—*W. Lawrence*, in Trans. of Medical and Chirurg. Society of Lond. vol. xvi. p. 367.—*R. Bright*, in ibid. vol. xviii. p. 1.—*J. J. Bigsby*, in Edin. Med. and Surg. Journ. vol. xliv. p. 85.—*Wolf*, in Gazette Médicale, t. v. p. 42. 1837.—*W. Thomson*, in Library of Medicine, vol. iv. p. 200.—*J. T. Mondière*, Recherches pour servir à l'Histoire Pathol. du Pancreas, in Archives Génér. de Méd. 2d ser. t. xi. p. 36. 265., t. xii. p. 133.

PARALYSIS. — SYNON. Παράλυσις (*resolutio, dissolutio*), λύσεσις; —*Resolutio nervorum*, Celsus; —*Paralysis*, Pliny, et Auct. Recent.; — *Carus paralysis*, Good; — *Paralysis*, Fr.; — *Lähmung*, Germ.; — *Paralisia*, Ital.; — *Palsy*. CLASSIF. — IV. CLASS. — III. ORDER (*Author in Preface*). See also APOPLEXY.

1. NOSOLOGICAL DEFIN. — *A diminution or loss of motion, or of sensibility, or of both motion and sensibility, in one or more parts of the body.*

2. PATHOLOGICAL DEFIN. — *Disease generally organic, either of the cerebro-spinal axis and ramifications, or of adjoining parts implicating these, so as to impair or altogether to abolish motion or sensation, or both, in a part, or more extensively throughout the frame.*

3. PARALYSIS presents itself in several *forms* and *states*, according as the *sensibility* or the *power of motion*, or *both*, may be affected; and according to the *degree* and the *extent* of the affection. It varies thus in grade, character, and extent, from the numbness or weakness of a single joint or finger, to a complete apoplexy, in which the sensation and motion of the whole body is abolished. These circumstances have led to the use of various terms, as respects the *form* and *extent* of the disease, that may briefly be noticed. As regards the *form* or *character* of the malady, when either motion or sensation is entirely lost, the paralysis is *complete* as respects that function; if either be impaired only, or not altogether lost, the disease is *incomplete*. If only one function is affected, the paralysis is *imperfect*; if both sensation and motion are *lost*, the disease is *perfect*, as suggested by Dr. BENNETT. Thus palsy may be not only complete or incomplete, perfect or imperfect; or both complete and perfect, or incomplete and imperfect; but it may even be complete as respects either function, and yet imperfect, inasmuch as one only is lost; or it may be incomplete and yet perfect as regards the affection of both functions.

4. Palsy has been divided, as respects its *extent*, into *partial* and *general*; the former has been further divided into *hemiplegia*, when one side or lateral half of the body is affected; *paraplegia*, when the inferior half is attacked; and *local* when a smaller portion of the frame is affected. It has, moreover, been called *idiopathic* and *symptomatic*; but those who have thus divided it have not pointed out in what its idiopathic nature consists. Palsy is generally, if not universally, a symptomatic malady, inasmuch as it depends upon lesion of the central nervous masses, or of the principal nervous trunks or chords, or of parts implicating them; as it is rarely owing to an affection of the parts themselves which betray the disorder, unless in a few instances of palsy from cold or from some agents directly influencing these parts.

5. Paralysis has been termed *continued* or *intermittent*, *fixed* or *moveable*, according as it presents these characters. It has likewise been called *plethoric*, *serous*, *bilious*, *febrile*, &c., according to its presumed cause, or to these states of concomitant disorder. Its origin in certain metallic and vegetable *poisons* has also been used, and with true practical advantage, to distinguish those instances which are thus produced. To these forms and characters of the malady attention will be directed in the sequel, as well to the *complications* presented by them in practice. In describing the several states and forms of paralysis, *loss of sensation* will be first considered, and afterwards the several forms of *loss of motion*.

I. VARIETIES AND STATES OF PALSY.

6. i. PARALYSIS OF SENSATION. — *Loss of Sensibility.* — A particular sense, or the feeling of a limited, or even of the greater, part of the body, may be impaired or altogether lost — the *palsy of sensation* may be *incomplete* or *complete* in the part affected; the affection being either *limited* or so extended as to be almost *general*. — Under the head of *local*, *limited or partial loss of sensation*, may be comprised incomplete and complete palsy of the several senses, although some of these affections of sense are treated of in separate articles.

7. *A. Loss of Smell — Anosmia*, is commonly a symptom of some disease, as a catarrh, &c. It is rarely observed as a simple affection unless it be caused by the abuse of stimulants or of irritants, as of snuff, &c. Dr. TODD and Dr. GOOD mention instances of this having been a congenital affection. It often attends *coryza*, *ozæna*, nasal *polypi*, diseases of the spongy bones, &c.; and it is sometimes caused by external injuries; by prolonged irritation or ulceration of the Schneiderian membrane; and by diseases of, or tumours pressing upon, the olfactory nerves. M. SERRES states that disease of the roots of these nerves, and more particularly of the external root, is not an infrequent cause of defect or loss of this sense.

8. *B. Loss of Taste — Ageustia*, sometimes also attends other diseases. It occasionally accompanies palsy of the tongue, or of the muscles of the face. It is frequently observed in continued and exanthematous fevers; and is in them, as well as in some other acute diseases, partially caused by the fur and viscid mucus covering the tongue and adjoining parts, that prevents the sapid body from coming into close contact with the nerves of taste. It may be produced also by the use of tobacco, especially by chewing it, or by other acrid substances. It has even arisen from want of exercise of the nerve of taste, as in a case detailed by Dr. ROBBINS (*Lond. Med. Gazette*, vol. x. p. 175.), in which, owing to an unsound tooth, substances were usually taken and masticated in one side of the mouth, without being brought in contact with the side on which the diseased tooth was situated. After the tooth was removed, it was found that taste in that side of the mouth was impaired. A slight degree of ageustia often is associated with loss of smell in severe catarrhs and coryza; and it is then owing chiefly to the state of the nerves of smell and taste. Marked impairment, however, of the former sense often also slightly impairs the latter. *Defect or loss of sight and loss of hearing* are fully discussed in the articles AMAUROSIS and HEARING.

9. *C. Defect or loss of Feeling. — Absence of the Sense of Touch. — Anæsthesia. — Insensibility of a part, or of the general Surface of the Body.* — Incomplete or complete loss of the sensibility of a

part sometimes occurs *alone* or independently of any other form of palsy; but it more frequently *precedes* or *attends* loss of motion, generally of the same part—in rare cases of another or opposite part. It very rarely *follows* paralysis of motion. It more commonly *precedes* loss of motion of the lower than of the upper extremities; but paralysis of motion is often unattended by loss of sensibility.

10. *a.* The *access* of anæsthesia is often sudden and without any premonition. Sometimes it is characterised by a perversion, rather than by an absence of feeling; the sensation of fine sand, or of some intermediate substance between the skin and the object touching it, being for some time present, before feeling is lost. In other cases, formications, slight tinglings, and incorrect reports furnished by the sense of touch, precedes for a short time more or less complete numbness.

11. The loss of sensibility may be very *partial* in any part of the surface. It may exist in one or more fingers only; and in this partial state may have been *congenital*, or have occurred soon after birth. Partial anæsthesia is observed most frequently in one limb, or in one half of the body, or in one side of the face. In this latter situation, when any substance is put between the lips, the sensation of its being broken is occasioned. Anæsthesia of the surface has been observed by M. ANDRAL in a number of round spots, the surrounding skin being quite sensitive. When loss of sensibility of any of the extremities is considerable, muscular motion of the same extremity is generally more or less impaired. In many cases, however, the defect of the muscular power of the part is caused by the want of report between sensation and voluntary action; for in holding an object in a hand which is deprived of sensibility, it is readily dropped if the eyes are not fixed on it: — the sensation of its presence not being conveyed by the nerves of feeling in the part, the act of volition is either imperfectly excited, or is not excited at all. In some such cases, also, it is probable, that volition is not transmitted in sufficient force to the muscles to produce prolonged or energetic action. In the familiar instance of numbness from pressure on one of the lower extremities, it will be found that the limb will not support the weight of the body unless volition be strongly exerted.

12. *b.* It is rare to find the sensibility of a part *completely* lost, so that it is insensible to the severest kinds of injury, as to fractures, burns, &c. Cases, however, of this kind have been adduced by YELLOWLEY, GOOD, EARLE, BROUGHTON, and others. It is also rarely observed to be *universal;* although it sometimes commences partially and extends gradually and generally, until nearly all the surface of the body is implicated. The more extended forms of *partial* anæsthesia generally appear in one half of the body — *hemiplegic anæsthesia* — and is limited with precision by the median line, or in the lower or upper extremities. In these forms it is most frequently followed by, or associated with, loss of motion of the same part. Cases, however, sometimes occur of complete anæsthesia, of one side existing without palsy of motion, or with very slight local palsy. In some cases of this kind recorded by Mr. BROUGHTON there was slight impediment only of speech. In the cases of hemiplegic anæsthesia which I have seen, the temperature of the surface was below that of the sound side, whilst in hemiplegia with loss of motion only, the temperature was somewhat higher than that of the opposite side.

13. *c.* The *duration* of anæsthesia is very indeterminate, and depends much upon the remote causes, upon the pathological conditions producing the affection, and upon the treatment. The affection may continue but a short time, as in cases of concussion, or of temporary pressure on a nerve. It may be very protracted, and terminate only with life. The sensibility may be restored unexpectedly, and sometimes even suddenly. When the anæsthesia is associated with loss of motion, it is generally protracted, although it is often removed, whilst the palsy of motion continues, or is but little relieved.

14. *d.* The *pathological changes* producing anæsthesia are not always obvious: they have even been incorrectly assigned; and it is doubtful whether certain of the localities, which are at the present day supposed to be especially and solely concerned in the propagation of sensation, are really thus exclusively employed. The alteration producing anæsthesia may exist in the brain, in the spinal chord, or in the nerves themselves; but, although the posterior roots of the spinal nerves appear to be more especially concerned in the function of sensation, it has not been fully shown that the posterior columns of the spinal chord are the appropriated channels for the transmission of sensation. Numerous cases are recorded, in which the posterior columns have been disorganised, or even the whole chord pressed upon, softened, or otherwise disorganised, and yet the sensibility has either been unimpaired or even increased. Some of these cases have been referred to by M. OLLIVIER, and others have been lately published in recent transactions of societies and periodical works. To these a more particular reference will be made in the sequel. I may here, however, briefly remark, that anæsthesia has followed causes affecting chiefly the surface of the body, as the prolonged influence, or excessive degree of cold. It has been likewise produced by torpid or interrupted circulation of blood in the part. It is sometimes a symptom in hysteria and hypochondriasis, in all which cases it is usually partial or limited as to extent; and it has occurred in the puerperal states. It has also appeared in connection with certain epidemics affecting the system generally, and the cutaneous surface and extremities more particularly, as that which prevailed during the summer and autumn of 1828 in Paris, — a circumstance calculated to support the view of the pathology of anæsthesia which I shall have to state hereafter.

15. ii. PARALYSIS OF MOTION. — *A. The more local and partial states of Palsy.*—Under this head are comprised those varieties of the disease which affect a part only of the body. They are divided, as already noticed, into — 1st. Local paralysis; — 2d. Hemiplegia; — and 3d. Paraplegia.

16. *A. Local paralysis* implies loss of motion, or of sensibility, or of both, in some part only of the body, and to a small extent. Although sometimes a permanent state of the disease, it is more frequently the commencement of a more extended malady.

17. *a. Paralysis of motion of particular muscles and parts* is not infrequent, occasioning affections, to which certain names have been applied according to their seats. — *Strabismus* is often caused by palsy of one or more muscles of the

eyeball, although not by this in all cases.—*Ptosis*, or falling of the upper eyelid, often arises from an atonic or paralytic state of the *levator palpebræ superioris*, owing to some alteration implicating the nerve which supplies it; although it may arise also from a spasmodic action of the *orbicularis palpebrarum*. A slight examination, or the degree of resistance opposed to raising the eyelid, will immediately show the nature of the affection. Ptosis from local palsy is often associated with squinting, showing that the third pair of nerves is palsied. It is always a serious affection, particularly when thus associated; and is often indicative of cerebral disease, being frequently a precursor of hemiplegia or even of apoplexy. It is a common and most unfavourable symptom of the advanced stages of diseases of the brain in children. It is, however, sometimes caused by a tumour pressing upon the nerves in some part of their course.

18. *b. Lagophthalmia*, or gaping of the eyelid, the eye being generally open or imperfectly closed, sometimes proceeds from paralysis of the *orbicularis palpebrarum*, owing to disease of, or implicating the *portio dura*. When this is the case, the affection is associated with a state of partial palsy about to be noticed.

19. *c. Palsy of the muscles of the face* is not infrequent, and is generally caused by pressure, injury or disease of the portio dura, and fifth pair of nerves. If loss of motion is complete, the portio dura and motor branches of the fifth pair are affected; if sensibility also be abolished, then the sensitive part of this nerve is implicated. Where the *portio dura* only is paralysed, there is little evidence of palsy until the muscles supplied by this nerve are called into action. As long as the patient neither speaks nor smiles the countenance presents nothing remarkable; and the sensibility of the face is unimpaired. But when laughing, coughing, sneezing, crying, or any of the actions of excited respiration are produced, the deformity of the countenance is apparent. The mouth is drawn to the sound side; the derangement of the features being remarkable in proportion to the intensity of the respiratory act. The affected cheek remains motionless, while the other is thrown into unusual action, is flaccid or swells out at the moment of expiration, or when the patient attempts to pronounce a word with emphasis, and appears broader and more prominent than the sound one, which is more contracted or wrinkled. The muscles moving the jaws and used in mastication, which are supplied by the motor portion of the fifth, still perform their functions. Owing to the palsy of the lips on the affected side, the labial consonants are imperfectly articulated; and saliva, or even aliments sometimes escape from the palsied side of the mouth. The patient is unable to spit out his saliva, or to blow fully, or to snuff up with the nostril of the affected side. Lagophthalmia generally accompanies this state of the disease, the eye appearing more prominent, and, being exposed to constant irritation, generally becomes inflamed. In protracted cases the muscles are wasted; and hence the face acquires a peculiar expression.

20. Palsy of the portio dura may be occasioned by severe or protracted cold, or currents of air, giving rise to what was usually termed a blight: but it is probably more frequently caused by an inflamed or enlarged state of the parotid gland or a tumour in the vicinity of the stylo-mastoid foramen, or inflammation or abscess of the internal ear, or by disease of the petrous portion of the temporal bone, or by a tumour or abscess compressing the nerve at its entrance into the internal auditory foramen; by disease of the brain at the origin of the nerve; or by ulceration implicating the nerve in some part of its course; or lastly by a wound or injury of the nerve.

21. When the *motor portion of the fifth pair of nerves* only is palsied, there is generally slight loss of sensibility of the parts supplied by this nerve; but the motions of the jaw on the affected side are impaired. Mastication is impeded, and is not performed on that side, owing to the palsy of the muscles which convey the morsel to the operation of the teeth, and to the lost action of the masseter and temporal muscles. There are still, however, command over the countenance, little or no distortion of the features, and no loss of expression. The jaw is in some cases a little depressed; but this disappears when the patient smiles or laughs, a circumstance distinguishing this variety of palsy from that caused by disease implicating the portio dura. This state of disease may exist alone; but it is commonly associated with loss of sensibility (§10. *et seq.*), and is usually further complicated with hemiplegia. The disease of the motor portion of the fifth pair may be seated in the course of the nerve, or in or near the origin of it in the brain.

22. As Dr. BENNETT has very justly remarked, it is rare that the lesions are confined to the fifth or to the seventh pair of nerves. In general the symptoms of disease of the one and the other are conjoined; although they seldom indicate an equal affection of both nerves. Commonly the disease appears first in the one, and then in the other; and, when the muscles on which the nerves first affected ramify are completely paralysed, the muscles supplied by the second are partially affected. In some of these cases, also, the paralysis is accompanied with neuralgia of a very acute description. Palsy of either of these nerves is very rarely met with in both sides in the same case. Dr. ABERCROMBIE met with an instance of palsy of the fifth pair on one side of the face, and of the portio dura on the other occasioned by a tubercle in the brain.

23. *d. Palsy of particular muscles or of a single limb* is not uncommon. Temporary palsy is not infrequently produced in these by casual pressure of the nerves supplying them. It may arise also from overstraining the nerves, or the muscles themselves, by over-exertion, as by lifting very heavy weights. Dr. HEALY has described instances of palsy of the hand and forearm owing to pressure caused by the head resting on the arm when asleep, which could be removed only by electricity; and Dr. DARWELL has ascribed the palsy consequent upon over-exertion to the injury done to, or overstraining of, the nerves supplying the affected muscles.

24. Palsy of a single limb is not infrequent in children. It is often congenital; and the upper are more liable to it than the lower limbs. It is sometimes owing to congenital disease or deficiency of the brain; but, when it takes place subsequently to birth, it has been imputed to a loaded state of the bowels, or to disorder of the stomach; but

disease of the brain or spinal chord is probably more immediately than those connected with its occurrence. Some of these cases grow up, and present the limb of a child joined to the body of an adult. I have met with several instances of this occurrence,—one in a physician, another in a medical student; both being characterised by remarkable irritability of temper. An upper extremity, which contrasted remarkably in size with the sound limb, was affected in both these cases.

25. Palsy of a part or of the whole of one limb, is very generally the commencement of a more extended malady; and instances are sometimes met with where only a few of the muscles of an extremity are affected; these being, according to Sir C. BELL, muscles naturally combined in action, although supplied with different nerves and different blood-vessels. Sometimes all the extensor muscles lose their power, while the flexors preserve it. In rare instances, also, as in the case of a lady lately under my care, the motions necessary for writing, or for any fine work, were completely lost, whilst the arm could be moved as strongly as ever. It has been supposed that the nerve in these cases is incapable of performing its functions owing to pressure or disease; and this is probably the case in some instances, as in those recorded by DRS. ABERCROMBIE and STOKES, and more especially when partial paralysis follows acute or chronic *neuritis*. It is even possible that, in other cases, the palsy is caused by imperfect or interrupted circulation through the blood-vessels of the limb, owing to disease of them, as supposed by GRAVES, STOKES, and others. But, in some instances, there are no indications of disease of the nerve itself, and the circulation is perfect in the affected extremity. In the case of the lady just alluded to, who is about 60 years of age, and of a full habit of body, there was no sign of disease in either the nerves or the blood-vessels of the limb itself. I prescribed for her blood-letting, which was performed under my own eye, twenty-four ounces being quickly taken away without any faintness being caused. After the depletion and purging, the partial state of palsy gradually disappeared.

26. *e. Paralysis of the tongue and muscles of articulation*, although occurring frequently in connection with hemiplegia and apoplexy, is very rarely met with alone. I have, however, been consulted in several cases, in which it was either the chief part of the disease, or was associated with difficult or impossible deglutition. In a case from the country, which I recently attended, complete loss of the power of articulation was associated with partial palsy of the extremities, the patient being deficient chiefly in the power of contracting the muscles of the hands and forearms. Both lower extremities were also weak. He returned without benefit from treatment, and died soon after. I have not learned the particulars connected with his death. In this case, loss of articulation was the first and chief symptom, yet the tongue could be protruded, without being drawn to either side.

27. Some years ago, Mr. WINSTONE consulted me in the case of a professional gentleman, aged about 50, who had, for many months, lost all power of uttering the most simple articulate sound, and who swallowed substances with the utmost difficulty, or not at all, unless they were conveyed over the base of the tongue. The tongue could not be protruded, and indeed was incapable of motion. The mouth also could be opened only imperfectly, but the sense of taste was not affected. He had neither headach nor any other ailment; and no other part was paralysed. He attended regularly to his profession during the usual hours of business; but was obliged to write down all he wished to say. The disease was ascribed to pressure or structural change at the origin, or in the course of the lingual and glosso-pharyngeal nerves; and the prognosis of suddenly fatal apoplexy or general paralysis was hazarded, which occurred some months after my attendance ceased. Various means were prescribed without any effect on the disease.

28. Most frequently, however, paralysis of the muscles engaged in articulation, or in deglutition, or in both functions, follows upon severe or renewed attacks of apoplexy, or of hemiplegia complicated with apoplexy. I have seen it occur after inflammation of the brain, and after cerebral convulsions in children, as in the case of a fine boy, respecting whom I was consulted by my friend Mr. WORTHINGTON of Lowestoft. The disease may continue for many months unmitigated by treatment; it is generally ultimately fatal; death taking place after or during a convulsive attack.

29. *f. Aphonia*, in the true sense of the word, can occur only when the *larynx* is affected—either its muscles being paralysed, or its structure changed, by serous or other effusion between its ligaments, tendons, or cartilages. Loss of the power of articulation depends upon paralysis of the tongue, cheeks, and lips; and this loss may be so complete as to prevent all *articulate* sounds from being produced; still the power of uttering sound remains, but in its simplest form only. When articulation is entirely gone, the motions of the muscles of the pharynx and base of the tongue are also lost. Simple aphonia is often caused by temporary inaction or torpor of the nerves of the larynx, in hysterical or nervous persons. Loss of the power of articulation is a much more serious and permanent malady than aphonia, and is either attendant upon, or followed by, the most general or fatal states of palsy, unless in hysterical cases; and in these, the motions of the tongue are also sometimes temporarily lost. In catalepsy, voice and articulation are quite lost, with all voluntary motion, but they return as soon as it is restored. In incomplete palsy of the tongue, protrusion of it may generally be effected; but it is generally drawn to one side, particularly if hemiplegia also exist. In other cases, it is usually protruded in a straight direction. The tongue, even in cases of hemiplegia, is not always drawn towards the sound side. Sometimes it is drawn to the paralysed side. LALLEMAND imputes its direction to this side to the action of the genio-glossus muscle of the unaffected side, drawing the base of the tongue forward, and turning the apex to the opposite side. CRUVEILHIER attributes the direction of this organ, when protruded, to feebler resistance on one side than on the other.

30. *g. Paralysis of any of the muscles of organic life* rarely takes place to any extent, and is indeed incompatible with the continuance of life, unless in those viscera which are particularly influenced by volition, as the urinary bladder, the sphincters, &c. A temporary state of relaxation, or loss of

the contractile power, of portions of the alimentary canal not infrequently occurs in the course of various diseases, and constitutes a part of the pathological conditions obtaining in inflammations of this canal, in colic and ileus, in lead colic, in hysteria, &c.: but it rarely continues for any considerable period, at least in a complete form, and in the same portion of the tube, without being followed by a fatal result.

31. *h. Palsy of the urinary bladder*, owing to over-distension, is a frequent occurrence: it is likewise connected with paraplegia; and in both circumstances of the complaint retention of the urine is the prominent phenomenon. Hysterical paralysis of the bladder is often met with. Dr. TODD says that there is much truth in Sir B. BRODIE's remark that, in these cases of hysterical paralysis, "it is not that the muscles are incapable of obeying the act of volition, but that the function of volition is suspended." Of course the muscles possess their capability of motion, no one could have suspected the contrary; that the function of volition is suspended in these cases is, however, a more doubtful proposition. The truth is, that a careful inquiry into the phenomena of hysterical paralysis, in some cases which have come before me, has shown that, owing to a weakened or exhausted state of the spinal chord and motor nerves, volition is not transmitted in sufficient force to produce muscular action; and that volition is not suspended, although it may be weakened; but that it must be made with more than usual energy to act upon, or even to be transmitted to the muscles.

32. *i. Palsy*, more or less complete, *of the rectum*, is not infrequent in aged persons, and in hysterical females. In these cases fæcal accumulations often form in the rectum and colon, owing to their inaction or want of power to overcome the resistance of the sphincter.

33. *k. Palsy of the sphincters* of the rectum and bladder attends most maladies in which either the brain or the spinal chord is oppressed, or has lost its power. The inability to retain the fæces, or the incontinence of urine which results, becomes one of the most troublesome and unfavourable phenomena of the disease. As, however, this form of local paralysis very rarely occurs unconnected with a more extensive malady, it will be more fully noticed hereafter.

34. *B. Hemiplegia* (from ἡμισυ, *the half*, and πλήσσω, *I strike*)—*semisideratio*—is used to denote paralysis of one side, extending to both the upper and the lower extremities. When the upper limb of one side, and the lower of the opposite side is affected, the palsy is usually called *transverse* or *crossed palsy*; but this form is comparatively rare. Hemiplegia is the most common form of the malady; and it occurs more frequently on the left than on the right side—the proportion being as three to two, according to the observations of Sir G. BLANE. Generally the paralysis extends to the side of the face, the angle of the mouth being drawn to the sound side, and a little upwards. The tongue also is often more or less affected, and on the same side, as shown either by its imperfect protrusion, or by its being drawn to one side—usually to the same side as the mouth. The pharyngeal muscles are sometimes also affected. Hemiplegia is limited exactly to one half of the body, the median line being the boundary, owing to the distribution of the spinal nerves.

35. The attack of hemiplegia occurs variously. 1st. It may appear gradually; local palsy, affecting first the fingers or toes, leg or hand, taking place, and extending slowly and gradually until the lateral half of the body is implicated. In some cases of this form of the disease, convulsive movements of a limb, or even of both limbs, are remarked, and continue until the loss of motion is complete.

36. 2d. After various chronic cerebral symptoms, and affection of one or more of the senses, the speech becomes affected, the tongue more or less pulsied, or protruded with difficulty, and the face distorted. Upon these, complete hemiplegia supervenes in a short period. This form is not infrequent in aged persons. In this and the preceding variety, several organic lesions, as tumours, tubercles of the brain, or its membranes, are often present.

37. 3d. After cerebral symptoms of a more acute and painful character,—after severe headach, febrile commotion, sometimes delirium or intellectual disorder, spasm or twitchings of the muscles, pain in the limbs, occasionally spastic rigidity of some of the flexor muscles, or even convulsions, complete hemiplegia takes place. In this variety, inflammatory softening of a portion of the brain is often present; and pain is complained of in the paralysed limbs.

38. 4th. After injury of the head at a more or less remote period, or after chronic cerebral symptoms, and various affections of some one or more of the senses, convulsions or epileptic seizures occur, which, after a more or less frequent recurrence, are followed by palsy of a limb, most frequently the arm, extending to the whole side; or at once by complete hemiplegia. In three cases of this variety, I found one or more abscesses in the brain. In these several states of hemiplegia, the sensibility is generally unimpaired, or but partially affected.

39. 5th. Hemiplegia may occur suddenly without any previous indication. In some of these cases, I have ascertained the existence of inflammatory attacks of the brain at a remote period, recovery having taken place long previously to the hemiplegic seizure. This variety is often followed by *apoplexy*, but at no precise period.

40. 6th. Hemiplegia frequently immediately follows an *apoplectic seizure*; or attends it, or appears in its course. In this variety more especially, and very often in that immediately preceding, hæmorrhage within the cranium has occurred. Generally the hemiplegia is observed only when the stupor subsides; but in many instances, it may be detected at first by a careful examination of the state of the extremities and features. According to my experience the sensibility is most frequently implicated in the fifth and sixth of these varieties of the seizure.

41. Although some reference has just now been made to the cerebral lesions upon which those varieties of hemiplegia individually appear most frequently to depend, still no precise or constant connection between the one and the other has been ascertained, and most probably it does not exist. Nevertheless, the relation is too frequent and too obvious to be entirely overlooked. Of hemiplegia it may be remarked, in general terms, that it may proceed from any one or more of the numerous organic lesions which are described in

the articles on the morbid anatomy of the BRAIN and its MEMBRANES, and of the CRANIUM. (*See these articles.*)

42. One fact may be relied on, viz. that the lesion exists, with very few exceptions, and these not very precisely determined, in the side of the brain opposite to the seat of palsy. Dr. R. B. TODD remarks that, according to the views of FOVILLE and others, we should expect to find the optic thalami and corpora striata, or some of the fibrous radiations which pass through these bodies, the seat of disease in hemiplegia; and in fact in the generality of cases, those bodies, or some portion of the cerebral hemisphere, present alteration of structure, variable in extent as well as in degree. It must be admitted, however, that cases occur in which one only of these bodies is the seat of disease, or in which no appreciable lesion can be detected in the hemisphere. Such occurrences, however, as Dr. TODD justly observes, can hardly be deemed to militate against the theory of FOVILLE, inasmuch as our ignorance of the mechanism of cerebral action, whether healthy or morbid, is alone sufficient to make them appear anomalous to us.

43. Hemiplegia is very rarely produced by disease of the upper part of the spinal marrow. In several cases of lesion of this part, in which I have been consulted, the paralysis has been at first local or partial, generally affecting one arm, but it has soon become more general. In some instances, however, one side has been affected more than the other, or one or two limbs more than the rest. Instances, however, have been observed of loss of motion on one side, and anæsthesia of the other, but these are remarkably rare. One has been adduced by PORTAL and another by Mr. DUNDAS. This latter case was consequent upon concussion of the spine produced by a fall. The temperature of the side and limbs deprived of sensation, but possessing muscular power, was $1\frac{1}{8}$° Reaumur, below the side which retained sensation without motion; the heat on this side being rather beyond natural, and the sense of feeling morbidly increased.

44. Hemiplegia may be *congenital*, or may occur soon after birth. M. CAZAUVIEILH has shown that congenital hemiplegia usually depends upon an arrest or defect of development or growth in a portion of the brain. The limbs of the affected side, particularly the arm, were stunted in growth, and flexed and contracted. The opposite hemisphere of the brain was generally smaller, the convolutions imperfectly developed, the capacity of the ventricle less, and the corpus striatum and optic thalamus of smaller size. Cases of this kind may attain an advanced age. Most of the instances I have had an opportunity of observing were idiotic, as well as incompletely paralysed on the deformed side. Cases of hemiplegia have occurred in which the opposite side has become similarly affected, either soon after the first attack, or during convalescence from it. In these, the sensibility has sometimes either been only partially, or not at all affected.

45. The paralysed side may be the subject of *pain*, the result of morbid action in the brain, or of *spasm*; hence designated spasmodic hemiplegia by SAUVAGES and others. In these, inflammatory irritation in the brain or its membranes, in the vicinity of the primary seat of lesion often exists. Deep-seated pain or spasm may occur in a limb, the superficial sensibility of which is either impaired or altogether lost; and either, or both phenomena, may affect the opposite or sound limb, although less frequently than the paralysed side. I have never seen an instance of hemiplegia with spasm of the paralysed side, to which the term of *hysterical* imposed by some nosologists, was strictly applicable. Hysteria very rarely occasions true or complete hemiplegia, but I have met with several cases of paraplegia caused by hysteria.

46. *Intermittent hemiplegia* has been noticed by SAUVAGES, MORGAGNI, CULLEN, ELLIOTSON, and TODD; but examples of it have been rarely and imperfectly observed. It would seem, that the congestion of, or vascular determination to, the brain, during the febrile paroxysm, occasioned a condition of one of the hemispheres, or of a portion of it, so as to interrupt the action of volition; but that the change was only temporary, and depended upon the state of circulation attending the febrile paroxysm—that it consisted neither of softening nor of hæmorrhage.

47. Much variety in the symptoms are observed in the course of hemiplegia, depending upon circumstances that will be alluded to hereafter, and upon a partial or more complete return of sensibility when this has been also lost, and upon a slight recovery of some of the motions of the limbs, particularly of the lower limb; but generally when the patient is able to walk a little, or with the aid of a stick, the lower extremity is usually thrown forward by the inclination of the trunk to the sound side. The foot is pointed outwards when the limb is raised, and falls from its own gravity. The affected arm is applied to the trunk, and the forearm is slightly flexed on the arm; the wrist and fingers being also slightly bent inwards, and occasionally somewhat œdematous.

48. *C. Paraplegia* (from παρὰ, *vitiose*, and πλήσσω, *percutio*,) has in modern times been applied to that form of palsy in which the lower half of the body is deprived of motion or sensation, or of both. HIPPOCRATES denominated all paralytic affections paraplegia, which were consequent upon apoplexy: and ARETÆUS employed the word to designate any form of palsy. BOERHAAVE and VAN SWIETEN defined paraplegia to be a palsy of all parts below the neck—or viewed it as a *general palsy* (§ 65. *et seq.*)—and in this sense it has been used by OLLIVIER and several modern pathologists. I shall, however, apply the term *paraplegia* to that form of palsy which affects the lower half of the body on both sides. When palsy extends to the upper and lower extremities of both sides it may be denominated, although it is not strictly, *general palsy*.

49. The symptoms most characteristic of *paraplegia* are, *loss of the power of motion in the lower limbs, with inaction of the urinary bladder and rectum, with loss of power over the sphincters, and often with impairment or entire loss of sensation.*

50. The *accession* of the symptoms of paraplegia, as well as the character, range and grouping of the symptoms themselves, varies with the pathological changes or physical causes of the malady—as it proceeds from injury, from inflammation and its consequences in the spinal chord or its membranes, or from organic lesions of these parts, or

of the bones and cartilages of the spine. When the disease is consequent upon injury, the symptoms are generally sudden in their accession and fully developed, although this is not always the case, especially if the accident be slight, and serious only as regards its consequences. When it proceeds from disease of the chord or of its envelopes, some disorder of sensation or of motion, or even of both, is first experienced, which becomes more or less rapidly increased to numbness, or diminished power of motion, of the lower extremities. The patient trips when walking, is unable to stand for any time, and complains of a sense of weight in the limbs, and of pains extending to the legs and feet. He cannot walk without the aid of one or two sticks, or of another person. The urinary bladder, rectum, and sphincters, soon afterwards become more or less affected, and various other phenomena supervene, according to the seat and extent of the organic change occasioning the affection. In some cases *sensibility* in the lower extremities is but slightly, or even not at all impaired, particularly when the lesion is seated high in the spine; and when this is the case, even the patient's power over the excretions and the sphincters may not be materially impaired. It is comparatively rare that sensibility is impaired or altogether lost in the lower limbs, without the power of motion being also diminished or abolished.

51. *a.* The *symptoms, progress,* and *consequences or terminations* of paraplegia vary with the lesion producing it; and it is difficult, if not impossible, to connect the symptoms in their full extent and course, with the particular lesion upon which they depend. The exact seat of lesion, in respect not only to the portion of the chord which it affects, but also to the roots of the nerves connected with the part implicated; the nature of the lesion, particularly as regards the degree of pressure, or of irritation, it produces; and the suddenness or slow progress of the change, all influence very remarkably the phenomena and course of the malady.

52. There are few diseases which have been more lucidly illustrated than paraplegia consequent upon injury has been in the admirable paper upon the subject published by Sir B. C. BRODIE; and as injury often causes inflammation and its usual consequences of the spinal chord and its membranes, the subject has both a medical and surgical bearing. Many, however, of the changes consequent upon injury—even hæmorrhage upon or into, and softening of, the spinal chord, — and various organic lesions of these parts or in their vicinity, may occur independently of external injury, and cause paraplegia. It will be proper to enumerate these.

53. [1]*a. Concussion* of the spinal chord affecting the intimate structure of some part of the chord, although not evidently to the unassisted eye; — [2]*b. Manifest laceration* or *division* of its substance; — [3]*c.* The *pressure* or *irritation* caused by *extravasated blood*; — [4]*d.* The pressure or irritation produced by *displaced bone*; — [5]*e. Sanguineous congestion*, particularly of the spinal veins or sinuses; — [6]*f.* The usual *consequences of inflammation* of the chord or of its membranes, especially effusion of coagulable lymph, induration of the substance of the chord, &c.; — [7]*g. Softening* of the chord, whether it be consequent upon inflammation, or upon impaired nutrition or lost vitality; — [8]*h. Inflammation* and its *consequences of the vertebræ*, or of the intervertebral substance, as *caries, exostosis, anchylosis, &c. of the vertebræ*; — [9]*i. Scrofulous disease* and *tubercles* in these parts; — [10]*k. Tubercles* or *tumours in the chord* or its membranes; — [11]*l. Hydatids* in either of these situations; — [12]*m.* And *fungoid* or *malignant tumours* implicating the chord or the roots of the spinal nerves, are severally pathological causes of paraplegia; but the symptoms of individual cases, as well as the issue, depend upon the part of the chord affected; upon the extent of the particular lesion; upon the slowness or rapidity of its development; and upon the manner in which the chord or roots of the spinal nerves is implicated—whether by pressure, loss of substance, softening, irritation, interrupted circulation, &c., or by two or more of these conjoined.

54. It would be inconsistent with a proper consideration of this subject, were I to overlook the physical condition of the spinal chord, especially in relation to the fluid surrounding it, to the membranes enveloping it, and the bony case protecting it. The physiological view here suggested materially aids the pathological consideration of the subject. This interesting physical condition also obviously concerns the roots of the spinal nerves, and serves to explain several circumstances connected with them, as well as with the spinal chord itself. These parts, being thus surrounded by a limpid fluid, and being protected by membranous coverings, and by a bony case and muscles, are thereby rendered much less liable to disease and injury, than if they were otherwise circumstanced, as first insisted upon by COTUGNO, more recently by MAGENDIE, and most satisfactorily by Dr. TODD. Before pursuing further this part of the pathological bearing of the subject, I will notice more fully the chief phenomena of paraplegia.

55. *b. Paralysis of motion* is the chief characteristic symptom of paraplegia, and it affects more or less all the muscles supplied with nerves from the seat of, and below, the injury or disease in the chord. If the disease be slight, only one limb, or a set of muscles, may be affected, as above adverted to, especially if the roots of a nerve or nerves on one side only be implicated; or one limb may be more severely affected than the other; or a slight affection may soon become severe, or the converse. Complete paraplegia may thus be gradual and slow; or it may be sudden. It rarely happens that the palsy extends to parts supplied with nerves proceeding from a portion of the chord above the seat of injury. Instances, however, of this occurrence are recorded by Mr. STAFFORD and Sir B. BRODIE. In these cases, it may be presumed that the consequences of the injury, as softening of the chord, effusion of blood or of lymph, had extended upwards from the part primarily injured.

56. Although voluntary motion is completely abolished in the lower limbs, involuntary motions and spasms of their muscles are not infrequent. When the lesion is seated high in the chord, spasmodic contractions, either of more or less permanency, or of a momentary or short continuance, may affect the abdominal muscles, as well as the muscles of the lower limbs, and these may be attended by much or by little pain, either in

some portion of the spine, or in the limbs. Occasionally the involuntary motions are of a tremulous kind, and often the flexor muscles are those more permanently contracted. The pains, involuntary motions and spasms, are manifestly caused by inflammation or irritation of the chord or of its membranes, or of the roots of the nerves, at the seat of lesion, especially by extravasated blood; by pressure or irritation of tumours, displaced bone, effused pus; by caries of the vertebræ, by malignant or other formations.

57. *c.* The *affection of the urinary organs* consequent upon paraplegia from injury or disease of the spinal chord varies in different cases. It may be considered with reference to the functions of the kidneys, and the states of the bladder. Paraplegia from severe external injury is very frequently followed by diminished secretion of urine, or even by complete cessation of the function; but this is often only temporary, and the urine is secreted in variable quantity and altered quality. In some cases, it is at first acid, very offensive, of a yellowish colour, and deposits a yellow amorphous sediment. More commonly, however, especially after two or three days, the urine is ammoniacal and turbid when voided, and deposits on cooling a quantity of adhesive mucus. At a later period, a white substance — phosphate of lime — may be detected in the mucus, which is often tinged with blood; and subsequently blood and bloody coagula are blended in the urine and mucus. These changes generally take place between the third and ninth days from the paraplegic attack, when it is sudden and complete, especially if caused by injury; and when the bladder becomes distended from loss of its contractile power. At the same time that this distension exists, a dribbling of urine often takes place, if the fluid is not drawn off. In other cases, especially in those caused by disease seated in, or implicating, the chord, the voluntary power over the sphincter of the bladder only is paralysed, there being incontinence, but no retention of urine. In the most severe cases, the urinary affection continues and hastens a fatal issue; but in others, the power of evacuating the bladder, or of retaining the urine, is restored; and the urine assumes a more acid and healthier character. This amelioration of the urinary disturbance is one of the chief indications of restoration of the functions of the chord; but the state of the urine often varies from time to time, before it becomes permanently healthy, or before the muscles of the extremities obey the will.

58. In these cases, where the urinary bladder is paralysed, and the urine retained, a state of septic or asthenic inflammation is rapidly produced in the mucous membrane of the bladder, ureters, and pelves of the kidneys, occasioning the chief changes observed in the urine, particularly the ammoniacal state, the presence of mucus, and coagula of blood, &c. Sir B. BRODIE has put the question, whether the injury of the chord operates directly on the mucous membrane, or whether its first effect is to alter the quality of the urine, the mucous membrane becoming affected afterwards owing to the unhealthy and irritating secretion? Instead, however, of imputing the effect on the urinary organs to one of these causes only, I believe that it may be justly imputed to both of them — that the unhealthy and irritating secretion rapidly induces inflammation of the surfaces with which it remains for a time in contact, owing to the marked disposition of these surfaces to become inflamed, when deprived of that portion of nervous influence which they derive from the spinal chord; and that they partake in this disposition to be inflamed and ulcerated with other parts below the seat of spinal lesion. In some instances, particularly when the lesion is seated high in the chord, or when the paraplegia is incomplete, or the power of motion principally affected, the urinary disturbance is not considerable, and the powers of expulsion and retention but little impaired.

59. *d.* The *bowels* are generally not only torpid in paraplegia, but the evacuations are very dark and morbid. This latter state is the more remarkable the higher in the chord is the seat of lesion. In a case lately under my care, the evacuations, which were procured with difficulty, were nearly black, or of a deep greenish black, and of a treacle or tar-like appearance and consistence. This colour is probably owing to impaired decarbonisation of the blood by respiration, the liver and digestive mucous surface performing a vicariously increased function in respect of sanguineous depuration, or of removing the superabundant carbon from the blood. This explanation of the phenomenon was published by me as early as 1815, and subsequent observations induce me to re-assert it now.

60. One of the earliest phenomena associated with paraplegia, is palsy or *inaction of the rectum and colon;* the latter viscus especially being unable to propel its contents. At the same time the sphincter ani is not relaxed, but subsequently, or as soon as the fæcal matters accumulate in the lower bowels, they pass involuntarily, owing to reaction of these bowels on their contents, and the loss of voluntary power over the sphincter. Incontinence of the fæces generally accompanies retention or incontinence of the urine; whilst, on the other hand, it is not remarked in the same states of the disease that are unattended by the urinary disturbance (§ 57.). Still, although the patient has power over the fæcal evacuations, particularly when the upper portion of the chord is affected, or when paraplegia is consequent upon disease slowly developed and implicating the chord, the stools are not the less black and offensive. They are often also very abundant, and the intestines are usually distended by gases, and are tympanitic.

61. *e.* The *sensibility* in paraplegia varies remarkably. When the palsy is caused by concussion or other severe injury of the chord, both sensation and motion are abolished. In slighter cases, and in diseases or spontaneous lesions implicating the chord, and occurring gradually and slowly, the sensibility may be unaffected, whilst motion is altogether lost. In other cases, sensation may be only blunted, or it may be impaired in one part, and perfect in another, or entirely lost. Very frequently sensibility of the surface only is impaired or abolished, whilst deep-seated parts retain their sensibility; and often pains, more or less acute, or feelings of heat, burning or constriction, are felt in the back, abdomen, or loins; or even in limbs or parts which are altogether insensible to touch and even to external punctures or injuries. Sensation is sometimes gradually, oc-

casionally suddenly, lost; but, as in hemiplegia, so in paraplegia, it is restored before the power of motion.

62. *f. Priapism* attends paraplegia from concussion or injury of the upper portions of the chord; but it sometimes occurs in those cases which are caused by disease. Sir B. BRODIE has not met with this symptom where the seat of lesion was below the sixth dorsal vertebra. It is observed even where the sensibility is altogether abolished. It seems to be occasioned, in some cases, by the irritation consequent upon the introduction of the catheter.

63. *g.* The *temperature* of the paralysed parts is generally above the healthy standard. This is most manifest in complete paraplegia from external injury; but I have observed it also increased in cases produced by disease, although not so generally and remarkably; and where the sensibility of the surface was unimpaired. This increase of temperature appears to be chiefly owing to the dry and unperspiring state of the surface of the paralysed parts, in connection with the state of the circulation and blood.

64. *h.* The occurrence of *gangrenous sores*, upon the least injury or pressure of any of the paralysed parts, is generally observed and is often remarkable. It seems to be attributable to an impaired vital cohesion of the tissues, caused by a loss of that portion of nervous energy bestowed on them by the spinal chord. It is most manifest in cases of severe injury of the chord, and when sensibility is altogether lost. When the lesion is seated high in the chord, and is more or less chronic, a scurfy, dry or furfuraceous state of the surface is often observed.

65. *D.* GENERAL PARALYSIS.—When palsy extends to both sides of the whole body — when all the limbs and trunk of the body are deprived of motion — the disease has usually been viewed as *general palsy*. In this very extended form of the malady, voluntary motion may alone be lost, sensibility still remaining. But the general sensibility is sometimes also more or less impaired, as in cases of paraplegia, much more rarely altogether abolished. Indeed, general palsy may be viewed as a more extended state of paraplegia, as it has been by some of the older as well as of more modern writers. In some rare instances the senses, or one or more of them, have been impaired, or even lost, as well as the power of motion and sensation. Instances of this kind have been published by M. DEFERMON and Mr. DAVIES GILBERT. In the more common states of general palsy, the affection extends no higher than the upper extremities; and depends upon some lesion implicating the spinal chord or its membranes below the origin of the pneumogastric nerves. In the rare instances where the senses are also implicated, the lesion is generally seated within the cranium, or in one or more of the parts composing the base of the brain. In the case described by Mr. D. GILBERT, it was found upon dissection that "the dura mater lining the basis cranii was deficient, and its place occupied by a thin and transparent membrane, loosely and singularly arranged; the tentorium cerebelli was likewise deficient, so that the posterior lobe of the brain rested immediately upon the upper surface of the cerebellum. All the nerves were regular."

66. *a. Concussion of the brain* and the *more severe states of apoplexy* are attended by general palsy; concussion of the brain especially implicating also the senses. These, however, occur differently, and are attended by phenomena which remove them from the category of paralytic diseases. The relation between them, however, is intimate. Motion, sensation, and consciousness are all lost in these maladies; respiration and circulation alone continuing. As soon as the respiratory nerves are affected by direct or counter-pressure in apoplexy, or by the change produced in the intimate structure of the brain or medulla oblongata, in concussion, life is soon terminated. When, on the other hand, the mischief is less extensive, and the patient regains consciousness, a more or less general state of palsy may remain, at least for a time, and either recovery take place, or hemiplegia or more partial palsy only remain. The *apoplectic* or *cerebral form* of general palsy may be viewed as an indication merely of the nature and extent of the cerebral lesion. A person may be seized with hemiplegia consequent upon softening of a portion of one of the hemispheres, or upon hæmorrhage in the brain, or upon any other organic lesion. A greater amount of the same lesion, or others concurring with it, may so completely subvert the powers of motion, and even of sensation, as to give rise to a general palsy, circulation and respiration alone remaining. These occurrences are not rare. Thus, inflammation limited to a portion of the brain may first occur, and be manifested by symptoms, which the close observer will detect. At an indefinite period subsequent to this attack, the patient may be suddenly seized with hemiplegia, and may continue in this state for weeks, months, or even years, when a profound apoplectic seizure occurs, occasioning general palsy, extending ultimately to the muscles of respiration, and causing death by asphyxia. But, in rare instances, instead of an apoplectic seizure, the other side may become palsied, as respects the power either of motion or sensation, or of both, and either before or after the side first affected has recovered any, or much of its powers. In this case there is general palsy, incomplete probably as regards one or other function, in either side, with certain of the senses and many of the faculties of the brain but little affected, until apoplectic coma or paralysis of the muscles of respiration terminates life. An instance of this kind recently occurred in the practice of my friend Dr. BABINGTON, and, upon dissection, lesions were found in both hemispheres of the brain.

67. *b.* The forms of general palsy to which I am most desirous of directing attention are altogether *spinal*. They may occur *suddenly*, as in cerebral general palsy, or *gradually*, and even slowly. Severe injuries, as dislocation of the cervical vertebræ, laceration of the chord, violent concussion of the spine, hæmorrhage upon the cervical portion of the chord, &c., usually occasion general palsy instantly; but disease seated in the spinal chord or its membranes, or implicating these consecutively, produces the paralytic phenomena much more slowly. Even severe injuries may not be followed by palsy for a considerable period; still it may be stated, that the accession of general palsy from injury, as well as the phenomena characterising it, will vary with the immediate or more remote effects of the injury upon the chord

or its membranes; it being either instantaneous or remote according to the extent and nature of the lesion produced. A muscular man, aged about sixty years, the father of a late medical friend, when turning in bed, his head being forcibly pressed on the pillow, so as to partially raise the trunk, felt something snap in his neck. He was afterwards unable to bend or to rotate the head without causing much pain in the neck. I inferred that rupture or laceration of some of the small muscles or ligaments had occurred, and advised quietude and various means, which palliated the more painful symptoms. Still the least movement of the head caused distress. Notwithstanding this, he travelled outside a coach, during the summer, to Cornwall, and returned to town; and not till sixteen months after the accident, he complained of numbness and want of power in the left arm. In a day or two the palsy extended to both the upper extremities, but was incomplete in the right; it soon became more general, and in a short time, difficulty of breathing, rapidly terminating in asphyxia, supervened. The body was examined by Prof. R. QUAIN and myself, and the second cervical vertebra was found fractured completely across on both sides, the fracture on one side passing close to the base of the odontoid process. Chronic inflammation had extended from the fracture to the theca and membranes of the medulla oblongata; lymph was thrown out upon the arachnoid surfaces; the membranes, particularly the dura mater, were much thickened, and ultimately the chord at this part was pressed upon.

68. Next to injury or concussion of the spinal chord, *caries* of one or more of the cervical vertebræ may be considered as a cause of general palsy; but the palsy rarely occurs until the disease of the vertebræ has induced chronic inflammation of the membranes of the chord, with thickening and effusion of lymph, or such a degree of angular curvature as to affect the physical condition of the chord itself. I was lately consulted in the case of a child, twelve years of age, who presented unequivocal indications of caries of one or two of the cervical vertebræ consequent upon malignant scarlatina. To these supervened incomplete palsy of motion in one arm and hand, which gradually increased and extended to the other arm and lower extremities, until general and complete palsy of motion existed; sensibility was unimpaired. The bowels were obstinately constipated, and the evacuations black and tar-like. The sphincters were not paralysed. Respiration was performed by the diaphragm; and all parts below the face were deprived of motion. The head could neither be rotated nor bent without great pain. The body and limbs were much emaciated. The skin was cool and dry, and covered with a furfuraceous scurf, particularly the scalp. The pulse was very frequent, weak and soft; the tongue furred and loaded. After persisting for many months in a treatment hereafter to be described, this young lady recovered the use of her limbs, the neck, however, remaining stiff, shortened, and turned a little to one side. In this case, the change produced in the membranes enveloping the chord, or in the theca, was most probably limited to the diseased vertebræ and their immediate vicinity. It is not unlikely owing to this limitation of the disease, and to the gradual accession and increase of it, that the sphincters continued unaffected.

69. *c.* General palsy may be only an *extension of paraplegia*; or, in other words, the disease may commence and continue for a time, as paraplegia, either complete or incomplete, and gradually extend higher and higher until the trunk and upper extremities are deprived of motion, sensibility being generally either not at all or but little impaired. In some of these cases, the palsy of the lower extremities, as well as that consecutively affecting the upper parts of the body, continues incomplete for a long time; the motions consequent upon volition being imperfect, weak and vacillating, and executed slowly, tremulously, and with difficulty. In these, the patient often complains of spasmodic or severe pains in the limbs, with a sense of constriction; of spasm and flatulent distension, with occasional attacks of painful constriction in the abdomen; of want of power over the sphincters, and involuntary discharges. This last symptom often varies much in different cases and different times in the same case, according to the treatment, &c.

70. In other cases, the paralytic symptoms either appear nearly contemporaneously in several parts or limbs, soon becoming general or more complete, or extend much more rapidly from the lower to the upper extremities, than in the immediately preceding class of cases. Still the same symptoms are generally present, only varying in some subordinate phenomena, sometimes continuing nearly stationary for months or even for years, and ultimately terminating in a similar manner. I occasionally attended, during nine or ten years, a gentleman somewhat above the middle age, who was affected with this particular form of general palsy. It was long incomplete, sensibility being but little impaired, even when the power of motion was altogether lost. Power over the sphincters was only partially retained for some years; but was very considerably increased by opiates conjoined with stimulants and aromatics; at last it was altogether lost. The intellectual powers were unimpaired. Ultimately cerebral symptoms, followed by coma and death, supervened. Permission to examine the body was allowed by his accomplished and highly intelligent relatives. The membranes at the base of the brain were more vascular than usual, and a considerable quantity of serum was effused. All the spinal arachnoid presented appearances of previous chronic inflammation. It was thickened, covered in parts with false membrane or adherent to the opposite surfaces by means of cellular bands. The whole dura mater or sheath of the chord was more or less thickened throughout, and the arachnoid of the chord, where it was not adherent, was opaque and thickened. The venous sinuses, placed between the bodies of the vertebræ and the sheath of the chord, were remarkably dilated and congested, so as manifestly to encroach upon the spinal canal and diminish its calibre, especially at the lowest part of the chord. The chord itself was firmer than usual, particularly in this situation, was somewhat atrophied, and its grey substance was wasted and less apparent. Its vascularity also was diminished, although the spinal veins and sinuses external to the sheath were remarkably dilated, and congested with coagulated blood.

71. Whilst I was treating the above case, a respectable tradesmen, aged about fifty, came under my care, and was seen by me occasionally until his death, which took place three or four years afterwards. The symptoms, protracted course, and termination of the disease, were altogether the same as those just described. On examination after death, the lesions found in the spinal chord were also similar to those observed in the preceding case. The chief difference was the less remarkable congestion of the spinal veins or sinuses; although this was considerable. The consequences of the chronic inflammation of the membranes, and the state of the chord itself, were nearly the same as those already described. There was, however, a more abundant effusion of serum between the membranes of the chord than in the former case; and much fluid was found in the ventricles of the brain. The upper portion of the medulla oblongata, and the membranes at the base of the brain, presented appearances of recent acute inflammatory action, especially increased vascularity and congestion, with a turbid serous effusion: these corresponded with the cerebral symptoms preceding death.

72. I have occasionally seen, during the last few years, with Mr. PETTIGREW, a gentleman, between thirty and forty years of age, whose complaints are nearly the same as those characterising the above cases, and are most probably owing to similar changes existing in the spinal chord and its membranes. In this case, the loss of power over the sphincters is more remarkable than in the preceding cases, or rather appeared earlier in the course of the disease.

73. The above cases of general palsy from *chronic inflammation of the membranes of the chord and its consequences*, came before me when the paralytic symptoms were more or less fully developed. I had an opportunity many years ago of observing the disease from its commencement. In 1820, a boy, aged thirteen, was brought to my house with chorea. He had rheumatism of the arms and wrists, associated with rheumatic pericarditis. After a few days the rheumatic affection subsided, and the chorea returned, with pain in the course of the spine. Leeches, &c. were applied along the spine; but the disease passed into a state of general palsy which was complete in respect only of motion, from the head downwards. All power over the sphincters was lost: sensibility of the surface was at first acute, and, although it became somewhat impaired as the general palsy was developed, still it was not materially diminished. After death, coagulated lymph and turbid serum were found effused between the opposite surfaces of the arachnoid of the chord in a very remarkable quantity, and so as to press upon the chord itself. (See *Lond. Med. Repos.*, vol. xv.)

74. *d.* It has been stated above (§§ 52, 53.) that *softening of the spinal chord*, whether it be the consequence of concussion of the spine, of inflammatory action, or of some other morbid condition of the vessels, or constituent tissues of the chord, is not an infrequent cause of paraplegia, when seated in any portion of the chord below the fourth or fifth cervical vertebra. When the disease is seated at or above this part, the palsy is nearly general. In a very remarkable case recorded by Dr. WEBSTER, the spinal chord was soft and pulpy in this situation, particularly the posterior columns; the membranes were adherent to the chord; close to the softened part, the medulla was of a dusky red tinge; but above and below this part it was healthy. The subject of this case "was for many months totally unable to move, even in the slightest degree, any muscle situated lower than the neck, but still retained the capability of feeling quite perfect throughout the surface of the body; whilst the other senses and intellectual faculties were unimpaired to the last moment of his existence. Indeed, the patient's cuticular sensibility even appeared, in the latter stages of the case, to be more acute than natural." The evacuations took place involuntarily; and violent spasmodic twitchings frequently affected the lower extremities.

75. *e.* Although general palsy as well as paraplegia is most generally caused by some manifest lesion seated in, or implicating, the spinal chord or its membranes, when the functions of the brain are unimpaired, still it is not to be inferred that the lesion is always of a nature which may be detected. Cases sometimes occur that present no appreciable lesion, at least to the unaided eye, upon dissection; and others recover after a treatment not obviously calculated to remove any serious lesion of the chord or its membranes. Sir B. BRODIE refers to a case (*Lancet*, No. 1060. p. 380.) which commenced as paraplegia and terminated in general paralysis. The spinal chord and solar plexus were examined with the greatest care after death; but they presented no change from the natural state. Sir B. BRODIE justly remarks, that it is not, however, to be supposed that this is a mere functional disease, because we see no lesion after death. The minute organisation of the brain and spinal marrow is not visible to the naked eye, and even with the microscope we can trace it only a little way. Some defect in the minute organisation, some change of structure not perceptible to our senses, may exist in the part and interrupt its functions.

76. Some years ago, I attended with my friend Dr. ROSCOE a gentleman who had resided many years in an intertropical country. On his voyage across the Atlantic to this country, in the winter season, he was seized with general palsy of the powers of voluntary motion immediately after prolonged exposure to cold and wet. The functions of the brain were unaffected; and neither pain nor uneasiness was felt in the neck or in any part of the spinal column, under any circumstances of position, flexure, rotation or pressure. No evidence of inflammatory action or of congestion in the spine could be detected. Cutaneous transpiration was suppressed, and the bowels were costive and torpid; but he retained the sensibility of the surface, and command over the sphincters. He was treated, at first, upon the supposition of either serous effusion or vascular congestion having taken place in the spinal canal, but without receiving any benefit. He ultimately, however, quite recovered by having a frequent recourse to warm baths containing stimulating substances.

77. That form or state of general palsy in which structural lesion may be inferred to be most decidedly absent, and which consists entirely of functional disorder, is the *cataleptic seizure*. In this affection, as shown elsewhere (*see art.* CATALEPSY), voluntary motion is altogether sus-

pended; but, in two very remarkable cases which I had an opportunity of observing attentively, consciousness and sensibility remained, with the senses of seeing and hearing. Yet no part—neither the muscles of the tongue or jaw, nor the eyelids—could be moved during the attacks, which often continued for many hours. Nor did the least muscular contraction take place on tickling the soles of the feet, or on pinching any part, although the sensibility was affected by these acts. Recovery from these seizures was generally sudden and complete; little disturbance, beyond slight hysterical disorder on some occasions, being observed.

78. *f. The symptoms of general palsy* vary much with the lesion occasioning it.—α. The *accession* of the attack also varies. In the *cerebral form* of the malady, particularly when it depends upon *apoplectic* or *epileptic seizures*, and when it assumes the cataleptic form, the accession is sudden or rapid. In the *spinal form*, the symptoms appear gradually, and generally slowly, when it is the result of disease, but often suddenly and completely when it proceeds from severe injury. In the cerebral state, the *sensibility* and even consciousness are abolished or nearly lost; but in the *spinal states* (§§ 67. *et seq.*) of the malady, sensibility, the functions of sense, and the intellectual powers are either unimpaired, or but little affected. In a few cases only is the sensibility of the general surface remarkably diminished, and in still fewer is it altogether lost.

79. β. The *loss of voluntary motion* is most sudden and complete in the cerebral states of the disease, and in cases of injury of the cervical portion of the chord, or of concussion of the spine. When the palsy proceeds from disease of the spinal medulla or of its membranes, the loss of motion is rarely complete at first, and often does not become complete until after several years, and until the organic lesions have advanced so far as evidently to interrupt the functions of the chord. Still there are exceptions to this, as the case noticed by Sir B. BRODIE. During the protracted progress of the malady, the patient often experiences spasmodic actions, or more permanent contractions of the muscles, particularly of the flexors; frequently a sense of painful constriction around the abdomen and the thighs; and sometimes, especially when the upper part of the cervical medulla is implicated, even convulsions or complete epileptic attacks. These are evidently the consequence of inflammatory action or irritation in or near the portion of the chord or its membranes which are the seat of lesion.

80. A compositor, who was engaged in printing a work which I was editing many years ago, came to me with caries of one or two of the upper dorsal vertebræ. Matter had evidently formed and was making its way externally. He became paraplegic, and subsequently generally paralytic; but at a very early period of the paraplegic state fully developed epileptic seizures occurred. These became more frequent, and ultimately terminated in coma and death. On examination, a sanious pus was found collected around the second and third dorsal vertebræ, extending between the muscles, and between the theca vertebralis and bodies of the vertebræ. The membranes at, and to a considerable extent above, this part were inflamed, the arachnoid surfaces being partially covered with lymph or adherent. Injection of the vessels and effused serum were traced thence along the membranes to the brain. The chord itself was not, however, materially changed.

81. γ. *Pain*, even of a most severe character, is often remarked, particularly in the inflammatory states of the spinal disease, and when the roots of the nerves, or when the nerves as they pass through the spinal foramina, are implicated in the lesion. The pains are usually deep-seated in one or more limbs, and are often not the less acute where the cutaneous sensibility is much impaired. In some instances of spinal general palsy the sensibility of the surface, particularly at first, is painfully increased, and sometimes even perverted. Pain is often felt in the part of the spine affected, either primarily or consecutively. In some instances, particularly when the disease commences in the lower portion of the spine and extends upwards, it may be confounded with lumbago; or it may be viewed as originating in lumbago; the pain in the loins being caused either by inflammatory action or softening, or by congestion of the spinal veins and sinuses. When the disease is consequent upon masturbation or venereal excesses, it is often preceded and attended by pain in the loins, extending upwards with the local lesion and the paralytic symptoms.

82. δ. The *bowels* are remarkably torpid, and the evacuations in the more complete states of the disease, dark, and like tar or treacle (§ 59.). The *urinary organs* are affected in the more complete and advanced forms, in the manner already noticed (§§ 57, 58.); but, in the less complete states, and when the spinal chord itself is not materially changed, the patient still retains more or less power over the evacuations and actions of the sphincters. In the more severe and sudden cases, particularly those consequent upon injury of any kind, and attended by marked disturbance of the urinary functions, priapism is a frequent symptom.

83. ε. The *external surface* is always dry, often scurfy, sometimes discoloured in the extremities, or presenting livid spots resembling vibices. It is generally emaciated, and colder than natural, even when the patient complains of a sensation of heat. The disposition of the surface to ulcerate or slough on pressure, so remarkable in paraplegia, is less so in general palsy, unless at the last stage or more severe and complete state of this latter form of the disease.

84. ζ. The *cerebral functions*—sensation and intellectual power—are unaffected in general palsy as well as in paraplegia, and continue unimpaired until the malady terminates either in fatal congestion of the lungs, or asphyxia, or in congestion of the brain with serous effusion.

85. II. OF PARALYSIS IN NEW-BORN INFANTS AND YOUNG CHILDREN. — Paralysis is sometimes met with in new-born infants. It may be the effect of injury to the nerve either in the part paralysed or in its course after its transmission through the cranial or spinal aperture. Dr. E. KENNEDY remarks that we have examples of this fact in injury to the portio dura, as in face presentations; or where the head has been long pressed in the pelvis against the projecting ischiatic spines; and he adds, that several cases of this kind had occurred to him, in which the disease was quite local, the paralysis being removed on

the subsidence of the swelling produced by the protracted pressure.—*a.* I have already mentioned (§ 44.) that the paralysis may be the result, not merely of spontaneous lesion of some part of the nervous centres during fœtal life, but also of arrested developement, or insufficient growth, during the early periods of this epoch. In this latter case the palsy is often associated with idiotcy. The cerebral or spinal lesion may, however, occur shortly before, as well as during the period of parturition. In the following case, recorded by Dr. E. KENNEDY, the lesion must have existed some time before birth; and, probably, from the speedy recovery, consisted merely of congestion of one side of the brain.

86. Immediately after birth, a large soft tumour was observed on the right side of the head, principally on the vertex, with two or three small excoriations on the left side. The left eye was closed; the mouth drawn to the left side; and when the child cried, the *ala nasi* and angle of the mouth were drawn up; the right eye was open, and the right side of the face unaffected during crying. The left side of the body was completely paralysed. The extremities of this side were of less bulk than those of the right, and were rough to the touch; the muscles were flabby. Both pupils were insensible to light. The child was unable to suck; but deglutition did not seem to be affected. On the third day it had several slight convulsions confined to the upper half of the body. A leech was applied to the vertex, followed by the warm bath: stimulating liniments were rubbed over the spine, and the child recovered. In this interesting case, the portio dura of the right side, and the levator palpebræ of the left side, supplied by the third nerve, were paralysed, in connection with hemiplegia of the left side.

87. It is often difficult to ascertain the extent of paralysis in new-born infants and very young children, as the paralysed limbs are generally either so much convulsed, or so spasmodically contracted, as to be removed from under the influence of volition. When the spasms cease, the paralysed state of the limb sometimes becomes more evident in the more unfavourable cases. The lesions which most frequently occasion paralysis in this class of subjects are, congestions of the brain and spinal column, serous effusion either between the membranes or in the ventricles, and extravasation of blood. This last is much less frequent in children and infants than in adults, and very rarely occurs in the cerebral structure. When hæmorrhage takes place within the cranium or spinal canal of infants, it is generally found to proceed from the surface of the membranes, and seldom causes permanent paralysis, but usually apoplectic attacks, or eclampsia, trismus, or convulsions terminating generally in death. In these cases, the effused blood produces either coma, spasm, or convulsions, according to the quantity effused; and ultimately, if the child live a short time, inflammatory action in the parts into which it is extravasated, owing to the irritation it occasions.

88. *b.* Paralysis, sometimes partial, at other times more or less general, accompanies the advanced progress of the disease usually called acute hydrocephalus, and of true or chronic dropsy of the brain. In the former of these maladies (*see* DROPSY, *acute, of the brain*), I have shown that the palsy is the consequence of the softening of the more central parts of the brain, rather than of the effusion into the ventricles which either attends or supervenes on the softening. The tubercles sometimes found in the brain, or its membranes, of children, either associated with, or independent of, softening and serous effusion, are rarely a cause of paralysis, unless at an advanced stage of these lesions, or as a termination of convulsions or spasms, with which, however, some degree of paralysis is occasionally associated.

89. *c.* But palsy is sometimes met with under different circumstances, especially during suckling and teething; and, although not so frequently as immediately after birth, still sufficiently often to have procured for it, as occurring at this period, more attention than has been paid to it. From the first dentition to the period of puberty, paralysis is generally the consequence of scrofulous caries or disease of the vertebræ, or of softening of a portion of the brain, or of tubercles within the cranium or spine. In cases of softening or tubercles in the brain or its membranes, convulsions, more or less of an epileptic character, almost always precede the paralysis, which commences generally in one arm, and sometimes passes into hemiplegia. When these lesions are seated within the spinal canal of young children, convulsions, of a more limited character, often spasms or contraction of a limb, are more frequently remarked either before the developement of palsy, or in connection with it; although, even in these cases, the convulsions may assume an epileptic character, particularly when the upper part of the chord is implicated.

90. *d. Infantile paralysis* may, therefore, be divided as follow:—1st. The congenital, and then it is commonly a consequence of arrested developement or congestion of a portion of the cerebro-spinal centres:—2d. That caused by the accidents attending parturition, as shown above (§ 85.):—3d. That consequent upon lesions or spontaneous disease, of a demonstrable nature, implicating the brain or some portion of the cerebro-spinal axis:—and 4th. That which presents no obvious lesion in the brain and spinal chord beyond slight congestion; and from which recovery often takes place, without sufficient evidence of organic lesion having been afforded. This last class of infantile palsies generally occurs in infants at the breast or during the first dentition. It is often sudden in its accession, and is preceded by no very apparent state of disease, beyond the usual irritation often attending dentition, or disorder of the alimentary canal or biliary functions. The arm is commonly the part affected; but the leg of the same side is sometimes either also paralysed, or contracted and drawn up, or both palsied and contracted. Sensibility has not been, as far as I have observed, impaired in the affected limb, but, on the contrary, sometimes morbidly increased. A large proportion of the cases which I have seen of this description has recovered after the means that will be noticed in the sequel have been employed.

91. My very learned friend, Dr. M'CORMAC, of Belfast, has noticed cases of paraplegia in infants, which he considered to proceed from concussion of the spinal chord—a cause by no means unlikely to produce the disease in both infant

pended; but, in two very remarkable cases which I had an opportunity of observing attentively, consciousness and sensibility remained, with the senses of seeing and hearing. Yet no part—neither the muscles of the tongue or jaw, nor the eyelids—could be moved during the attacks, which often continued for many hours. Nor did the least muscular contraction take place on tickling the soles of the feet, or on pinching any part, although the sensibility was affected by these acts. Recovery from these seizures was generally sudden and complete; little disturbance, beyond slight hysterical disorder on some occasions, being observed.

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88. *b.* Paralysis, sometimes partial, at other times more or less general, accompanies the advanced progress of the disease usually called acute hydrocephalus, and of true or chronic dropsy of the brain. In the former of these maladies (*see* DROPSY, *acute, of the brain*), I have shown that the palsy is the consequence of the softening of the more central parts of the brain, rather than of the effusion into the ventricles which either attends or supervenes on the softening. The tubercles sometimes found in the brain, or its membranes, of children, either associated with, or independent of, softening and serous effusion, are rarely a cause of paralysis, unless at an advanced stage of these lesions, or as a termination of convulsions or spasms, with which, however, some degree of paralysis is occasionally associated.

89. *c.* But palsy is sometimes met with under different circumstances, especially during suckling and teething; and, although not so frequently as immediately after birth, still sufficiently often to have procured for it, as occurring at this period, more attention than has been paid to it. From the first dentition to the period of puberty, paralysis is generally the consequence of scrofulous caries or disease of the vertebræ, or of softening of a portion of the brain, or of tubercles within the cranium or spine. In cases of softening or tubercles in the brain or its membranes, convulsions, more or less of an epileptic character, almost always precede the paralysis, which commences generally in one arm, and sometimes passes into hemiplegia. When these lesions are seated within the spinal canal of young children, convulsions, of a more limited character, often spasms or contraction of a limb, are more frequently remarked either before the developement of palsy, or in connection with it; although, even in these cases, the convulsions may assume an epileptic character, particularly when the upper part of the chord is implicated.

90. *d. Infantile paralysis* may, therefore, be divided as follow:—1st. The congenital, and then it is commonly a consequence of arrested developement or congestion of a portion of the cerebro-spinal centres:—2d. That caused by the accidents attending parturition, as shown above (§ 85.):—3d. That consequent upon lesions or spontaneous disease, of a demonstrable nature, implicating the brain or some portion of the cerebro-spinal axis:—and 4th. That which presents no obvious lesion in the brain and spinal chord beyond slight congestion; and from which recovery often takes place, without sufficient evidence of organic lesion having been afforded. This last class of infantile palsies generally occurs in infants at the breast or during the first dentition. It is often sudden in its accession, and is preceded by no very apparent state of disease, beyond the usual irritation often attending dentition, or disorder of the alimentary canal or biliary functions. The arm is commonly the part affected; but the leg of the same side is sometimes either also paralysed, or contracted and drawn up, or both palsied and contracted. Sensibility has not been, as far as I have observed, impaired in the affected limb, but, on the contrary, sometimes morbidly increased. A large proportion of the cases which I have seen of this description has recovered after the means that will be noticed in the sequel have been employed.

91. My very learned friend, Dr. M'CORMAC, of Belfast, has noticed cases of paraplegia in infants, which he considered to proceed from concussion of the spinal chord—a cause by no means unlikely to produce the disease in both infants

I lately saw him without any remains of the paralytic affection, which, however, had continued during two or three years. Paralysis from this class of poisons generally affects the powers of sensation more or less remarkably.

106. *E. Ergot, or spurred rye*, sometimes occasions palsy, especially of sensation: but the effects of this substance are fully treated of in the article Ergotism.

107. V. General History of Palsy.—i. Of the various Disorders preceding and attending Palsy.—From the description of the several varieties of palsy, it will be seen that the power of motion is much more frequently impaired than that of sensation; that either may be singly, or both jointly, affected in various grades, but that, when motion is totally lost, sensation is frequently more or less impaired; that sensibility is very rarely entirely lost in a paralysed part, and still more rarely over the surface of the body; and that palsy is both preceded and accompanied by considerable derangement of the general health as well as of the nervous system, to which especial attention should be directed.

108. *A.* It is impossible to notice all *the premonitory symptoms of palsy*, as the varieties and relations of the malady are so numerous as to render them both diversified and inconstant, and as they depend very much upon the nature of the pre-existing disorder and of the remote causes. *Hemiplegic palsy* is often preceded by the same premonitory symptoms as have been mentioned in connection with the accession of Apoplexy (§ 4.), especially by various affections or disorders of one or more of the senses, particularly of hearing, sight, and touch; by neuralgic pains about the face or head; by twitchings, spasms, or convulsions; by weakness of muscles or of a limb; by headaches, restlessness, sopor, lethargy, or watchfulness; vertigo, faintness, and unsteady gait; irritability of temper, loss of memory; imperfect or difficult utterance; flatulence, costiveness, and various dyspeptic symptoms; more or less manifest indications of irritation or inflammatory action in some part of the brain; epileptic seizures; and most frequently apoplectic attacks. (*See above*, § 40. and Art. Apoplexy, § 4.)

109. The *paraplegic and general states of palsy* are often preceded by pain in the course of the spine, sometimes resembling, and frequently mistaken for, lumbago; by spasms or cramps of particular muscles; by pain in the neck, or wry-neck; by neuralgia or neuralgic pains; by numbness of the toes or fingers; by attacks of nephritis; by increased sensibility of the surface of one or more limbs, or of the body generally; by costiveness and colicky pains, or obstinate constipation; by retention of, or difficulty of voiding, the urine; by chorea, partial convulsions, or various anomalous nervous disorders; and by the more limited forms of partial palsy.

110. *B. The disorders of the nervous system, and of the general health accompanying palsy*, are various in different cases according to the seat of the malady.—*a.* In *hemiplegia* and palsy of any of the organs of sense, the memory, and in severe or prolonged cases, even the intellectual powers are more or less impaired; the palsy extending even to the mental powers. This state, however, is the most remarkable in the complication of general palsy with insanity, hereafter to be noticed. The temper and disposition are often changed from their usual characteristics, persons of a mild disposition becoming peevish and irritable, and those who have been irascible becoming placid; in some cases, the memory, chiefly of words or of names, is impaired or perverted, so that the patient substitutes those which either are inappropriate or have an opposite meaning to that which he wished to convey. The powers of attention and application, and mental energy generally, are usually impaired.

111. The action of the *heart* and *lungs* is seldom much excited in hemiplegia or cerebral palsy, unless when inflammation of a portion of the brain supervenes upon or attends the lesion causing the hemiplegic state. Nor is the action of these organs oppressed or impaired, unless effusion, so as to cause direct or counter pressure, takes place, or the medulla oblongata becomes in any way implicated. Hence the temperature of the surface of paralysed parts is seldom lower than natural; and frequently, owing to diminished transpiration from the surface of these parts, it is higher than in other situations.

112. *Digestion* and *assimilation* are often but little disturbed or impaired. In some cases, vomiting or nausea, with or without flatulence, attends the accession of hemiplegia; but subsequently acidity, heartburn or flatulence, is complained of. The appetite is but little impaired; it is even frequently keen or craving, and is generally too great for the amount of exercise taken and of air consumed by respiration, and consequently for complete digestion and assimilation. This keenness or craving appetite I have often remarked as an indication of latent irritation in the substance of the brain. The bowels and liver are usually torpid, and often require powerful cholagogues and purgatives to act on them.

113. The *nutrition* of a paralysed part is often not materially affected when the disease occurs after the growth of the body has been matured. Occasionally, however, some degree of shrinking or atrophy exists, especially in prolonged cases, owing chiefly to disuse of the muscles. The nerves are also somewhat atrophied. Very frequently an œdematous state of a paralysed limb is observed, increasing its bulk, although the muscular and other soft parts may be more or less wasted or atrophied. The urinary functions are seldom much affected in hemiplegia and other cerebral forms of palsy.

114. *b.* In *paraplegia and general palsy* the attendant phenomena have been already fully noticed (§§ 48. *et seq.*), and consist chiefly of lesion of those functions which depend upon, or are influenced by, the part of the chord which is the seat of disease. As the brain continues unaffected until the fatal termination of the disease draws near, so the mental powers continue unimpaired till that period arrives.

115. When the medulla oblongata or upper part of the chord is affected, the *action of the heart* and *lungs* is often much disordered; and if these parts, especially the former, are pressed on, or much disorganised, death by asphyxia is more or less speedily produced. In slighter lesions of these parts, remarkable slowness of the pulse, in some cases, and great rapidity of it in others, are often observed.

116. Respiration is usually performed chiefly

by the diaphragm, and the quantity of oxygen consumed during the process is very small: consequently the heat of the surface is low, and transpiration from it much diminished. The skin is dry, becomes covered with a branny or furfuraceous substance, owing to rapid exfoliation of the cuticle. When the lesion is seated lower in the chord, or so as not to impede the motion of the chest, and consequently not to diminish the action of the air on the blood, the parts below the seat of injury experience diminished or interrupted cutaneous transpiration; and, instead of any diminution of temperature, they present an actual rise of temperature, owing to the interrupted transpiration, the functions of respiration not being impaired.

117. The *heat of the surface* of paralysed parts depends upon the state of respiration and the consumption of oxygen, in connection with the amount of transpiration from that surface; for, whilst the oxygenization of the blood proceeds without diminution, suppression of the cutaneous transpiration will raise the temperature of the surface on which transpiration is suppressed; but when the oxygenization of the blood is impaired, suppressed transpiration cannot have this effect, or only to a small amount. If the change produced by respiration on the blood be much impeded, the temperature will generally continue much below the natural standard. This appears to me to be the true cause of the different states of temperature of paralysed limbs in different cases; and it is preferable to account for the phenomenon conformably with established principles, upon which a sound and safe practice may be based, than to mould it so as to suit a pre-conceived hypothesis, and to make it subserve a doubtful or hazardous treatment.

118. It may be objected, however, that the rise or fall of temperature in a paralysed, or in an inflamed part, may be independent in some degree of states of respiration; and this is actually the case; for, although the passage of oxygen into the circulation takes place in the lungs, the oxygenization of the blood, or rather of certain elements of the blood, occurs chiefly in the systemic capillaries, under the influence of the organic nervous power; the oxygen combining partly with these elements for the nutrition of the tissues, and partly with the carbon of the blood. The change in the capacity for latent heat consequent upon the combination of oxygen with these elements in the several parts of the body, is great in proportion to the extent of combination; and, as this combination is strictly a vital process, or at least brought about by vitality, although conformably with chemical laws, so it takes place independently of the cerebro-spinal nervous system. Notwithstanding that this combination and the change of capacity for caloric consequent upon it are independent of this system, and are effected chiefly by vital or ganglial nervous power, still they may be influenced by the cerebro-spinal system. The passions and emotions show this; but they also prove the predominant influence of the organic nervous system; their physical action —their operation on the circulation and the tissues —being through the medium of this latter system. Fear blanches the cheek and lowers the temperature of the surface; sexual passion produces turgescence of the erectile tissues and heightens the temperature: but these, as well as other mental emotions, change the state of the circulation and temperature by depressing or exciting, according to the nature of the emotion, the organic nervous or vital power in the first instance, the effect upon the circulation and temperature being consecutive. The independence of the organic or vital nervous system of the cerebro-spinal is shown, even in those vital organs which are most influenced by the mental emotions and the spinal chord, in the course of paralytic cases. Thus palsy, even when general, does not extend to the organs of generation. Erections take place in almost all the varieties of the disease, if no other concomitant complaint exist to prevent them; they are even morbidly frequent or constant when the upper part of the spinal chord is congested, inflamed, or otherwise implicated. Pregnancy proceeds in its usual course, and parturition takes place, in the natural way, in cases of paraplegia or general palsy in females.

119. When the upper part of the chord is the seat of lesion, the *stomach* is sometimes so much disordered as to reject its contents. The bowels are obstinately confined, as above noticed (§ 59.); the tongue is furred and loaded; the urinary organs remarkably affected (§ 57.); and the vital cohesion of the superficial and other tissues below the diseased portion of the chord is more or less impaired, disposing them readily to undergo asthenic inflammation, sloughing, &c. (§§ 64.)

120. ii. The Associations and Complications of Palsy.—As palsy is generally a symptom or consequence of some lesion sustained in a part of the cerebro-spinal nervous system and nerves, it will readily be admitted, that it will frequently present itself in practice as an accident or result of an immediately antecedent and intimately related disease, and often be associated with such disease—with apoplexy; with inflammation and softening of the brain; with similar lesions of the spinal chord; with structural changes of the membranes of the brain, and of the spinal medulla; with disease of the cranial and spinal bones; with epilepsy, convulsions, hysteria, and catalepsy; with insanity, imbecility, and idiotcy; with rheumatism, lumbago, and congestions of the spinal sinuses; with neuralgic affections; with inflammation of the kidneys, or other parts of the urinary apparatus. In the progress of all these maladies, some form or other of palsy may appear, whenever lesions of structure, or even congestions, take place in, or extend to, any portion of the cerebro-spinal axis, or nerves proceeding from it, during their course; or, in other words, when palsy is complicated with any of these maladies, it is a consequence of the vascular and organic lesions characterising or supervening in the progress of such malady. The importance and danger of these complications require that a brief notice should be taken of them.

121. *A.* Of all diseases, *apoplexy* is the most frequently associated with, and the most intimately related to palsy, especially to, hemiplegia, and to some states of general and partial palsy. The complication of apoplexy with palsy is fully described in the article Apoplexy (§§. 31—49.). I have there shown that it generally presents itself as follows:—1st. *The apoplexy occurs as the pri-*

mary malady, and is either associated with, or followed by, paralysis; — 2d. *The paralysis, in some one or other of its partial states, often in that of hemiplegia, first appears, and is followed, after a very indefinite period, by an apoplectic attack more or less profound.*

122. *a.* In the *first* of these complications, the paralytic affection may disappear in a short time after the apoplectic seizure, or not until after several days or weeks. It may be permanent, or continue for years, or until another apoplectic seizure carries off the patient; or it may be rendered more complete or general, or it may affect additional or different parts, those first affected being either partially restored or unchanged, by renewed seizures of apoplexy, or by coma attended by sinking or exhaustion. In these cases, death is usually produced by the apoplectic state, or by a comatose sinking, attended by a general palsy, in which, owing probably either to nervous exhaustion, or to counter pressure on the base of the brain, or on the medulla oblongata, or to lesions extending to these parts, the respiratory organs participate. I have described fully, in the article just referred to (§§ 34. *et seq.*), the lesions usually observed in these circumstances; and I need not, therefore, allude to them further, than to state that, in the slighter and less prolonged instances, they consist chiefly of congestion and serous effusion; and, in the more severe and permanent cases, of extravasations of blood, softening of portions of the brain, and of extravasation and softening conjoined. In some cases, little or no lesion is seen, or at least lesions insufficient to account for the phenomena and for death; and in other cases, in connection with one or more of these lesions, effusion of serum in the ventricles, or between the membranes; inflammation of a portion of the brain, or of the membranes; and other concomitant or contingent lesions, are observed. (See art. Apoplexy, § 36. *et seq.*)

123. *b.* In the *second* of these forms of complication (§ 121.), the palsy in some one or other of its more partial forms, frequently in that of hemiplegia, is the primary seizure; and is generally then caused by alterations in some part of the substance of the brain, especially by softening, hæmorrhage, cysts, tumours, tubercles, and by almost any of the diversified lesions described in the article Brain and its Membranes, particularly when they have arrived at an advanced state of developement. Many of these lesions are followed by inflammation, softening, congestion, or effusion of serum or of blood in the brain or its membranes, causing either a more complete or a more extensive palsy, or spasms or contractions of one or more limbs, or superinducing apoplexy, which may either terminate life, or be removed, leaving the pre-existing palsy more complete or extended than before. (See arts. Apoplexy, § 46. *et seq.*, and Brain.)

124. *B.* Palsy may become associated with *epilepsy;* but it is generally a consequence, even when thus associated, of repeated returns of the epileptic paroxysms. Even in the earlier attacks of epilepsy, occurring in young persons, the epileptic fit may be followed by incomplete palsy of the limb, or of certain muscles, especially of an arm, or of the muscles of articulation, &c. In these cases the palsy may soon disappear, and follow the next or subsequent attacks; and may continue without much variation, or become more complete until either hemiplegia, or even more general palsy, supervenes. In some instances, the epileptic seizure may present a mixed character, or a state intermediate between apoplexy and epilepsy; or it may be viewed as apoplexy attended by convulsions — a form of seizure which had been overlooked until it was described in the early parts of this work. These mixed forms of seizure are not infrequently followed by palsy. It has been stated in the articles Brain and Epilepsy, that any organic lesion of the brain or of its membranes may be followed by epileptic attacks; and these lesions, in a more advanced stage of developement, may occasion either palsy or apoplexy — often both in succession, at very indefinite intervals. The slighter states of palsy consequent upon the epileptic fit may be viewed as the result of congestion, more particularly affecting that portion of the brain that has most intimate relations to the paralysed part. Where, however, the palsy is more complete or extensive and permanent, it may be viewed as depending upon similar changes to those which have been alluded to as causing palsy in connection with apoplexy (§ 121.); and if the palsy be attended by contractions or spasms either of the paralysed or of the sound limbs, inflammatory action or irritation may be inferred to exist either in the vicinity of the cerebral lesion, or in another part of the brain, according to the seat and character of the spasms, &c. In rare instances, the same lesion of the brain that causes the epileptic or convulsive seizure may induce at the same time a paralytic state. These cases usually soon terminate fatally.

125. *C. Inflammation of the brain* may be complicated with palsy; but in this state of disease, the inflammation is generally limited to a portion of the brain. Either affection may be primary, and thereby give rise to two states in which this complication presents itself in practice. 1. *The changes consequent upon the inflammation may induce those further changes upon which the palsy depends;* thus, inflammatory softening favours cerebral hæmorrhage, and this latter usually causes the paralytic state. 2. *The lesion primarily causing the palsy may induce inflammation of the adjoining parts of the brain, and the phenomena usually consequent upon this state;* thus, blood extravasated, or a tumour formed in the brain, will occasion palsy, and inflammatory action will often follow in the surrounding cerebral structure, or in the adjoining membranes, or in both structures, and give rise to the association of the chief phenomena of inflammation of the brain, or of its membranes, with the paralytic state. Both these states of association may present themselves even in the same case; thus, a gentleman attended by Dr. Paris and the author, had inflammation of the brain, and after the more acute attack had been removed, hemiplegia supervened. The hæmorrhage, consequent upon the inflammatory softening, and productive of the palsy, after a short time reproduced the inflammation, which was again subdued; but after some months an apoplectic seizure took place, and carried off the patient. In cases of this complication, the membranes may or may not be implicated, according to the seat of primary lesion, or to the nature of that lesion.

126. *D. The complication of insanity with palsy* has been very fully discussed in the article on INSANITY (see §§ 33—36., and 167—172.); and I, therefore, need not further allude to the subject at this place than to state, that the palsy generally does not appear until after the mental disorder; often not until the latter has continued for a considerable time, and assumed a chronic and general form. In some cases, however, insanity and palsy occur almost simultaneously; and, in a few, the paralytic affection precedes the mental derangement. Palsy thus associated is commonly *general*, or soon becomes such. It is usually incomplete, especially in its early stages, and affects chiefly the muscular system. The sphincters and consequently the evacuations are uncontrolled by volition. This form or association of palsy is usually a result of chronic inflammation of the brain, and is distinct from palsy caused by cerebral hæmorrhage, softening, tumours, &c., which, however, may also occasion the more partial, or an hemiplegic form of palsy in the course of insanity; but these latter are not so frequent as the general palsy just alluded to, and fully described in its more appropriate place (INSANITY, §§ 167. *et seq.*). The paralysis of the insane may be further *associated* with epileptic, convulsive, apoplectic or comatose states, either of which may terminate life, or the patient may sink from vital exhaustion. The appearances observed after death from these complications are minutely described in the art. INSANITY (§§ 235. *et seq.*).

127. Palsy is not infrequently also associated with *idiotcy*, and with *puerile imbecility* (see art. INSANITY, §§ 522. *et seq.*). In these complications the palsy may be either general or partial; but when it is general, some parts are usually more affected than others, and imperfect developement of portions of the cerebro-spinal axis is often seen on examinations of them after death.

128. *E.* Although both *paraplegia and general palsy* are often produced by the more common consequences of *inflammation of the spinal chord* and *of its membranes*, still the inflammation, as well as those consequences, may still continue after the paralytic state has been produced, and thus become *associated* or *complicated with it*. The history of cases of this description, and some of those above noticed, suggests this position; and the appearances I have observed during the examination after death sufficiently confirm it. The importance of attending to this circumstance cannot be over-estimated in a practical point of view, as being suggestive of a rational treatment of these cases. The persistence of inflammatory action in the spinal chord and its membranes, particularly the latter, during the paralytic states depending upon lesions of these parts, is often evinced by pain in the spine, by spasms or contractions of the muscles, by pains in the limbs, and by the various phenomena usually attending inflammations. In some instances, the inflammation occasions not merely spasm, contraction, or pain of the muscles supplied with nerves from the part of the spinal chord which it affects, but also more general convulsions; or, when the upper parts of the chord is implicated, epileptic seizures or coma and asphyxia.

129. *F.* Disease of the *cranial and vertebral bones*, or of *the periosteum*, sometimes *complicates* as well as *causes palsy*, particularly in the scrofulous diathesis. In these cases, the disease of the bones extends to the membranes enveloping the brain or chord; and inflammation, with its usual consequences, when affecting these membranes, supervenes and interrupts the functions of, or extends to, the inclosed portion of the cerebral or spinal structure. Thus, I have repeatedly met with instances of caries of the petrous portion of the temporal bone, consequent upon neglected ottorrhœa, that were followed by inflammation and abscess of the adjoining membranes and cerebral structure, and by palsy, with various concomitant and consecutive phenomena. Cases of this description not infrequently occurred to me in dispensary practice, and in children at the institution for their diseases. Lesions of the *cranial bones* associated with, as well as causing palsy, may be the result of disease or of injury. Thus, a portion of the parietal bone was remarkably and permanently depressed in a boy by accident, and coma with hemiplegia was the result. The coma soon passed off, but the hemiplegia continued for a time. Ultimately, the palsy also was altogether removed; and, long before he reached the period of puberty, the paralysed side had become as strong as the other. The depression, however, continued as remarkable as before; yet, notwithstanding this, the subject of this accident became, and still is, a most powerful and talented man, with whom I have been acquainted for more than thirty years.

130. Disease, particularly *scrofulous caries of the vertebræ*, is a frequent cause and concomitant of paraplegia and even of general palsy, as in the case above noticed (§ 68.); and not only may the palsy be associated with disease of the vertebræ, but also be further accompanied with epileptic seizures. A young man several years ago consulted me respecting epileptic attacks, each of which was preceded by the *aura epileptica*, which proceeded from the palm of the left hand to the lower cervical vertebræ. On examining the hand, the palm of it was found swollen, and obscure fluctuation was detected in it. The part was opened and matter was discharged from beneath the palmar fascia. The fits disappeared for a considerable time; but pain and stiffness in the lower cervical and upper dorsal vertebræ were complained of, and were attended by a diffused swelling. The epileptic attacks returned and paraplegia, nearly amounting to general palsy, supervened. An abscess pointed between the scapula and spine which was opened; and the patient soon afterwards was carried off by an epileptic seizure. In this case, caries of the vertebræ, purulent infiltration of the adjoining muscles, and inflammation of the membranes of the chord, with effusions of coagulated lymph, adhesions, &c. were found after death: and the inflammation of the spinal arachnoid, with serous effusion above the seat of adhesions, had extended to the arachnoid of the medulla oblongata and the base of the brain.

131. *G. Neuralgic affections* of the face, head, or limbs, not only *precede* but also occasionally *accompany palsy*. The pain sometimes ceases when the palsy takes place, especially if the muscles supplied or connected with the pained nerves are those paralysed; but it is sometimes only alleviated. The neuralgic pain is occasionally complicated with the palsy, particularly when they occur on different sides of the body. Neuralgic pains may thus accompany hemiplegia, paraplegia, and any

of the more partial states of palsy, the latter affection supervening after the former has been of long duration (see Art. Neuralgic Affections, (§ 72). It is only in rare instances that neuralgia appears in the course of palsy, or that the latter is the primary affection.

132. *H.* Palsy is sometimes *associated with rheumatism*, but not so frequently as might appear on a superficial view of the matter. The pains, whether dull, gravative, gnawing, &c., sometimes complained of both before and during paralytic affections, are often mistaken for rheumatism, or for neuralgia, although they are the not infrequent attendants of that change of structure at the origins of the nerves supplying the pained parts that ultimately produces palsy. The pains may be even felt in different parts from those which are paralysed; and they are then to be viewed as the extension of inflammation, or of other organic lesions, to parts differently related. The pains in the loins or back, so often viewed as *lumbago*, and felt more or less by persons addicted to venereal excesses or to manustrupation, are occasioned either by congestion of the spinal sinuses, or by inflammatory action of the membranes of the chord; and although they are most frequently the precursors of palsy, particularly of paraplegia, still they not infrequently accompany it, and extend either to the sound or to the affected limb, or even to both.

133. *I.* Palsy, or palsy associated with apoplexy, is not infrequently consequent upon *organic disease of the heart*, particularly hypertrophy of the left ventricle, and lesions of the valves or auriculo-ventricular orifices. The remarks which I offered in the Art. Apoplexy (§ 96.) on the connection subsisting between that disease and structural changes in the heart are quite applicable to the complication of those changes with palsy, especially with hemiplegia. In this complication, the disease of the heart is generally the primary malady, and more or less aids in the production of the paralytic affection, although some lesion of the vessels or substance of the brain may have pre-existed, or have been contemporaneous with the cardiac disease.

134. *K. The association of palsy* with *disease of the kidneys* and *urinary organs generally* has already been noticed, with reference only, however, to the supervention of disease of the latter upon paraplegia and general palsy (§ 57.). But the complication now to be noticed is of a different kind. When the kidneys, either from intense inflammation, or from a primary state of inaction or palsy, cease to perform their functions, and retention of urine from this cause results, a state of excrementitious plethora is produced, not infrequently terminating in fatal coma or apoplexy. These may assume the form of general palsy; and, in rare cases, hemiplegia may take place. In these, the procession of morbid phenomena is sufficiently manifest; but in others it is much less so; especially in those which present the occurrence of paraplegia consequent upon the nephritic disease. Mr. Stanley in an interesting memoir (*Trans. of Med. and Chirurg.* Soc. vol. xviii. p. 260.), has adduced several cases, in which inflammation of the kidneys existed in connection with paraplegia, and appeared as the primary malady, and yet no change was observed in the spinal chord or its membranes. Some of the cases deserve a brief notice.

135. A man complained of retention of urine conjoined with paraplegia; motion and sensation being lost. Tenderness on pressure was felt at the third lumbar vertebra. After death, no lesion could be detected in the vertebræ, spinal chord, or its membranes. The kidneys presented inflammatory changes with small abscesses dispersed through their substance.

136. A man had retention of urine consequent upon the suppression of gonorrhœa by injections. He complained of pain in the back, paralysis of the lower limbs, and of the sphincters. He distinctly traced the course of the pain from the bladder, upwards to the kidneys and across the loins. On dissection, the kidneys were inflamed, with minute purulent depositions throughout their substance. The bladder was inflamed, and its inner surface partly covered by coagulable lymph. The brain and spinal chord presented no disease.

137. A man, aged thirty, stated that he had been suffering for a day or two from pain in the loins, when he was seized with paraplegia extending to the umbilicus. The loss of motion was complete, and the loss of sensation nearly so. The functions of the brain were unaffected. The urine flowed involuntarily, and three pints were drawn off by the catheter. In sixteen hours from the attack of paraplegia, the man suddenly died. The kidneys were found gorged with blood and nearly black. The mucous membrane of the urinary passages was congested. The substance and membranes of the spinal chord and brain were sound, vascular turgescence of these parts being but slightly greater than natural.

138. I believe that, if cases of the kind now adduced were carefully observed at an early stage of their course, sufficient evidence would be found of congestion of the veins or sinuses placed between the sheath of the chord and the bodies of the vertebræ. This congestion would of itself be sufficient to cause disorder of the urinary functions and inflammation of the kidneys and urinary passages, which would re-act upon, and aggravate the spinal lesion. In the examinations of these cases no mention is made of the state of the venous sinuses of the spine.

139. *L.* Palsy is sometimes *associated with hysteria*, and the association has been noticed in the article Hysteria (§ 35.). A remarkable case of this complication was lately attended by Mr. Flockton and myself: — A young lady had experienced hysterical symptoms with irregularity of the catamenia, to which had supervened suppression of this discharge, attacks of vomiting, sometimes alternating with diarrhœa, and complete paraplegia, as respected the power of motion. The sensibility was only slightly affected. The urine required to be regularly drawn off. There was no tenderness in the course of the spine; and all the cerebral functions, the organs of sense, the intellectual powers, and the moral feelings seemed to be in unimpaired vigour and duly regulated. She had been long ill, and had been under the care of various eminent men both in London and in fashionable watering-places. The treatment, which will be noticed hereafter, restored her in the course of a few weeks, and after three or four months she was quite recovered.

140. It is very difficult to explain the connection between hysteria, or disordered states of the female organs, and palsy. But it is not im-

probable that many of the symptoms, and particularly those of a paralytic character, arise not merely from irritation propagated from the uterine system to the roots of the spinal nerves, or to the spinal chord itself, but rather from super-induced congestion of the spinal veins and sinuses, the congestion being attended either by interruption to the circulation in the chord, or by compression, or even by both. This change will account for the frequent connection also of palsy of the urinary bladder with hysteria, even when paraplegia is not present. Yet even in these cases, pains in the limbs, with weakness and partial loss of power, are often complained of. When the remote causes of hysteria are considered, particularly in connection with the effects they produce upon the spinal chord and roots of its nerves, the frequent supervention of congestion of the spinal veins and sinuses may be viewed as altogether conformable with the laws of the animal economy.

141. VI. DIAGNOSIS.—Palsy, in a simple and primary form, cannot be mistaken for any other malady. It is only when it appears secondarily, or associated with any one of the diseases just mentioned, that the diagnosis requires attention; and, even then, the object is chiefly to ascertain which is the primary affection, to trace the nature of the connection between them, and to form some idea as to the structural changes, upon which the paralytic symptoms — which are usually sufficiently manifest — depend. It is to this last that our chief attention should be directed: this is the great object of diagnosis, and one which is not only very difficult to determine on many occasions, but almost impossible on some.

142. *a.* When palsy presents any of its more *partial states*, the question of its origin will suggest itself; and the chief point to determine is, whether the affection depends upon lesion at the origin of the affected nerve in the cerebro-spinal centre, or whether it proceeds from disease in the course of, or in the nerve itself. If there be no symptoms of disorder referable to the brain or spine — if neither pain, disordered function, nor sensation, can be observed — and more especially if disease implicating the nerve can be detected, the source of the palsy becomes manifest. In palsy of the face, disease of the portio dura, and tumours or matter pressing upon the nerve, are readily detected. When the ganglionic portion of the fifth pair is implicated, the affection of the eye, and the symptoms mentioned above (§§ 19—22.) in connection with the states of the other senses, and of the functions of the brain generally, will readily indicate the seat of the disease. The various circumstances of the case will also aid the diagnosis. Previous injury, the presence of tumours, or of periostitis, the scrofulous diathesis or manifest scrofulous disease, the occupation of the patient, and the operation of lead or arsenical poisons, &c., severally aid the diagnosis.

143. *b. Hemiplegia* is generally caused by disease in one side of the brain; but it may be produced by lesion in one side of the spinal chord, although very rarely. When it proceeds, as it usually does, from the former source, it is often preceded by cerebral symptoms, or attended by an apoplectic seizure. The chief difficulty is to determine the nature of the lesion producing it; for the several changes, upon either of which hemiplegia may depend, are not attended by determinate phenomena. When it proceeds from hæmorrhage it is usually, as above noticed (§§ 39, 40.), both sudden and complete in its accession, is often not preceded by pain, and is frequently associated with apoplexy. If it proceed from softening, or from tumours or morbid growths of any kind (see art. BRAIN, § 111. *et seq.*), it is generally preceded by cerebral symptoms, by various nervous disorders, by pain, &c., and attended by spasms, convulsions, contractions or pains; its accession is usually slower, and it is at first less complete than in other circumstances. Tubercles in the brain or in its membranes are not infrequently causes of palsy in children from one or two years of age to twelve or fourteen, as stated in the art. BRAIN (§§ 19. 115.), and more recently by Dr. H. GREEN.

144. I may here remark, that considerable lesions, or morbid growths, may exist in or near the periphery of the brain, or implicate chiefly the cineritious substance of the convolutions, without causing palsy, although coma, convulsions, or epilepsy generally result. I have remarked this circumstance in several cases; but I have never seen any marked lesion of the central parts of the brain without palsy being present.

145. *c. Paraplegia* has been assigned above (§ 53.) chiefly to disease of, or implicating, the spinal chord or its membranes. But it was supposed by Dr. BAILLIE, Dr. GOOD, and others, to arise much more frequently from disease within the cranium. Many years ago I controverted this doctrine (see *Lond. Med. Repository*, vol. xviii. p. 522. 1822). I then took occasion to state "that, although I admit that paraplegia will sometimes result from lesions seated at the base, or in both sides of the central parts, of the brain, still I contend that it most commonly arises from diseases of the spinal chord." "The chief reason of the prevalence of the cerebral pathology of paraplegia appears to be the old physiological opinions respecting the nervous system still entertained by many; and the circumstance of the brains of paraplegic subjects being, in conformity with preconceived notions, the only parts of the nervous masses which, until lately, had attention paid to them. It is by no means unlikely — and many pathologists have recorded the fact — that a patient, who has been for some time paraplegic from lesion in the spinal chord or its membranes, shall die apoplectic, or shall expire from lesions subsequently developed in the brain. This latter morbid structure, instead of being consecutive, may be even co-existent; but, at the present day, I should not expect to hear a pathologist conclude, because he found lesions in the brain, that the paraplegia therefore arose from the cerebral disease only. I would be still more surprised were I to hear the same inference drawn without any examination of the spinal canal or medulla oblongata having been made. Now I do contend that such conclusions have been actually drawn from such inconclusive data as the above, by those who suppose — for the inferences of those investigators are but suppositions at the best — that paraplegia is generally seated in the brain." Thus I wrote in 1822, in opposition to the then received doctrine; and now the justice of my views, which even then were based upon tolerably extensive observation, are almost universally acknowledged.

146. Admitting, as I have done, that paraplegia

may occur, in rare instances, from disease in both sides of the more central parts of the brain, or near its base, it will be asked, How is paraplegia from this cause to be distinguished from spinal paraplegia? In many cases, the evidence of the former is negative only. There are no circumstances nor symptoms indicating disease in the spinal chord, membranes, or containing parts, and then we are constrained to look to the brain for it. But where, in addition to this evidence, there are indications, antecedently or concomitantly, of cerebral affection,—if any of the functions of sense or manifestations of mind be impaired, or otherwise affected, or if headache or vertigo be present,—the source of disorder may thus be conceded to the brain.

147. Where it is manifest that the paraplegia proceeds from disease implicating the spinal chord or its membranes, the question as to the nature of that disease is often solved with great difficulty. When paraplegia is caused by accidents, injuries, wounds, &c., the nature and seat and direction of these often assist the diagnosis. The suddenness or slowness of the accession of the malady, viewed in connection with the presence or absence of pain and tenderness in the spine, will often suggest correct views. Thus antecedent pain, tenderness on pressure, &c., and the continued presence of these, constrictive pains in the limbs or in the abdomen, spasms or contractions of the muscles, &c., will indicate congestion or inflammation in some one or more of the constituent tissues of the part, particularly if the palsy supervene gradually, and if the remote or exciting causes are such as are likely to occasion these lesions. If pain in the back occur suddenly, and is attended almost immediately by paraplegia, extravasation of blood may be dreaded; or the displacement of a previously diseased vertebræ, or sudden effusion produced by disease of the spinal bones, may be inferred. (See SPINAL CHORD AND MEMBRANES, INFLAMMATION OF.)

148. Debility of the muscles of the spine causing curvatures of the column is rarely attended by any considerable degree of paraplegia. When this palsy is associated with disease of the spinal bones, the curvature is *angular*, owing to caries and absorption of one or more of the bodies of these bones. In the former case attempts to straighten the spine are not attended by pain or risk, and the patient can lie on the back or abdomen without pain. In the latter, such attempts are dangerous, or even fatal; as in a case of caries of one or two of the cervical vertebræ, for which a surgeon was consulted, and an attempt which was made to straighten the part was soon afterwards followed by general paralysis. I was afterwards called to the patient, who recovered after a most protracted confinement. When palsy is associated with angular curvature, as in a case now attended by Mr. CHILCOTE, which I occasionally see, any attempt to lie on the back, or to straighten the spine, is followed by pain; and in another case just seen by me, such attempts produce convulsions. These attempts always interfere with those processes from which alone recovery is to be expected. (See art. SPINAL COLUMN.)

149. vi. CONSEQUENCES, TERMINATIONS, AND PROGNOSIS.—*A*. Several of the *consequences* of palsy have been already alluded to (§ 56. *et seq.*), but as the affection is chiefly a consequence itself of pre-existing disease, it seldom induces further change unless what becomes speedily fatal; and that change is seated chiefly around, or in the immediate vicinity of, the lesion causing the palsy. Owing to such change, the mental powers are often weakened, or altogether lost in hemiplegia, or attacks of apoplexy or coma supervene: a partial palsy may become more extended; and even imperfect paraplegia may gradually increase and be more complete or be general, ultimately terminating in coma or apoplexy, or in asphyxia from injury to, or counter-pressure on, the medulla oblongata. The principal consequences of palsy, especially when the spinal chord is implicated, are manifested in the urinary organs, the digestive canal and respiratory functions, and in the weakened state of vital cohesion of the tissues of the paralysed parts; and these have been severally noticed at length. (§§ 57—64.).

150. *B*. The *terminations* of palsy are chiefly *apoplexy, coma, sinking* of the *vital powers, asphyxia, convulsions* or *epileptic seizures* terminating fatally, and more or less complete *recovery*.—*Apoplexy* frequently supervenes on hemiplegia or partial palsy, and either aggravates it or terminates life. A state of gradually ingravescent *coma* may also terminate these states of palsy and even general palsy, although this last variety frequently causes *asphyxia*; death occurring sometimes gradually, at other times suddenly—*gradually*, from defective oxygenation of the blood and diminished production of carbonic acid, coma usually intervening; *suddenly*, owing to the arrest of the actions of the respiratory muscles and functions, and of the heart, consequent upon lesion at the origins, and complete paralysis of the respiratory nerves. In both these latter classes of cases the blood after death is fluid and of a dark venous colour.

151. Paraplegia either passes into general palsy and terminates as stated above (§ 150.), or becomes fatal owing to consecutive changes produced in the urinary organs, or to sloughing of the parts upon which the body rests, sinking of the powers of life, and contamination of the circulating fluids arising from these alterations. When the upper portions of the chord or the medulla oblongata become affected, epileptic attacks or convulsions occasionally occur and even terminate existence, rather by the attending or superinduced asphyxia, than by the amount of injury sustained by the brain.

152. *C*. The *prognosis* of palsy depends much upon the grade of severity, or the complete or general character of the malady, and upon its duration. In forming a prognosis, the circumstances alluded to when noticing the consequences and terminations of the disease should be taken into account. When the palsy is *local* and independent of lesions in or near any part of the nervous centres, or where it is caused by any of the metallic poisons, hopes of recovery may be reasonably entertained. But when the disease depends upon organic change of these centres or of their envelopes; when it is complete and extensive; when a whole side of the body is affected; and when it has been of considerable duration, perfect recovery rarely takes place. I have met with this favourable result only in two or three cases. Yet, although perfect recovery so rarely occurs, the state of the patient may be ameliorated, and the patient may live many years

without the occurrence of any of the unfavourable consequences or terminations of the malady, if a suitable diet and regimen be pursued. In all cases, the causes of the attack, and the nature of the antecedent disorders and attendant symptoms should be considered. When the palsy is attended by great disorder of the digestive organs, when the urinary organs are remarkably affected (§ 57.), and when the sphincters are relaxed, when spasms or contractions of the muscles are present, or convulsions supervene, and when the nature of the organic lesion implicating the brain, spinal chord, or their envelopes, is manifestly such as cannot be entirely removed, the most unfavourable opinion may be formed of the result, although the ultimate issue may be deferred for a considerable time.

153. The *complications* also of palsy should influence the prognosis. The most unfavourable of these are the associations of hemiplegia with apoplexy or coma; with inflammation of the substance of the brain, as indicated by spasms, contractions, and pains of the limbs; with neuralgia of the nerves of the face or head; with epilepsy or convulsions; with insanity, imbecility, or *idiotcy*; with disease of the heart or of the *liver*; with lesions of the cervical spine; and with inflammation of the kidneys. If the palsy supervene in the course of these, it may be generally assumed as the result of severe, if not irremediable, organic change in the brain or spinal chord.

154. Palsy of the muscles of articulation, of the tongue, or of deglutition, whether appearing alone or in connection with hemiplegia, is a most dangerous state of the malady, and often precedes more complicated and severe forms of the disease, that will soon pass into fatal convulsions or apoplexy, or asphyxia. Fully developed *shaking palsy* is rarely materially ameliorated by treatment; although patients afflicted with it may live many years without much increase of the symptoms.

155. Recovery often takes place from the *hysterical* or *uterine complications* of palsy, although even in these the absence of all organic lesion of the nervous centres or of their envelopes ought not to be generally inferred; for irritation of the uterine organs or suppression of the catamenia may be followed by inflammation and its usual consequences in these parts, particularly in the spinal chord, or by congestion, especially of the venous sinuses of the spine, sufficient to produce interruption of the act of volition from the brain to the nerves of the extremities, owing to the pressure which such congestion may occasion.

156. Recovery from the less complete, and least complicated states of palsy from the metallic poisons, is sometimes brought about, by careful treatment and suitable precautions and regimen. A case of complete hemiplegia consequent upon apoplexy caused by monkshood, respecting which I was consulted many years ago, quite recovered after a protracted treatment.

157. VII. CAUSES.—i. The *remote causes of palsy* are more strictly the causes of those maladies in the course of which alterations of the nervous centres most frequently occur, and are so entirely the same as those which I have adduced in the articles APOPLEXY, EPILEPSY, INFLAMMATION OF THE BRAIN, &c., as to require merely to be enumerated at this place.

158. *A.* The *predisposing causes* are chiefly hereditary predisposition, advanced age, the male sex, mental labour, luxurious habits and sexual indulgences. I have observed a greater frequency of palsy in the children of those who have died of diseases of the brain, than in others. Palsy is much less frequent in children and young persons, or in those under thirty years of age, than in persons further advanced. According to the Registrar-general's report, the deaths in the metropolis, in two years, from palsy, were 33 under fifteen years of age,—614 from fifteen to sixty,—and 932 at sixty and upwards; and from the same authority it would appear, that the number of deaths is as great in females as in males. Palsy is most frequently observed in persons whose habits are sedentary, and in those of feeble constitution. It is said to be more frequent in the sanguineous and nervous, than in other *temperaments*; but this is not established. There can be no doubt of mental labour, depressed and anxious states of mind, luxurious habits, and venereal indulgences, being most influential causes of predisposition to palsy. Indeed the various circumstances which I have assigned as predisposing to APOPLEXY (§ 77.), have a similar influence in respect of palsy. Amongst these vascular plethora may be mentioned; and when this state is present, hemiplegia either alone, or complicated with, or consequent upon, apoplexy, is the form of palsy most frequently observed.

159. Various *arts* and *employments* (see that article) remarkably predispose to palsy, especially all those in which lead, arsenic, and mercury are much used; as painters, plumbers, glaziers, &c. &c.; and in persons thus exposed, the disease occurs at earlier epochs of life than in other circumstances. It is least frequently observed in those who lead a sober and active life, and are much in the open air. It is rarely met with in sailors and soldiers; but this is partly owing to comparatively few of them being far advanced in life. The influence of the *seasons* or of *weather* in favouring attacks of palsy, has not been shown with any precision; but cold and moist seasons and weather, and cold, humid, and miasmatous localities, are certainly more productive of paralytic affections than other seasons, weather, or situations.

160. *B.* The *exciting causes* of paralysis are—1st. *Physical, mechanical and external agents*;—2d. The *mental emotions*;—3d. *Pathological states or pre-existing lesions*;—4th. *Poisonous substances.* These may act—(*a.*) directly upon the ramifications or trunks of nerves;—(*b.*) or directly or mediately upon the cerebro-spinal axis.

161. *a.* Of the *physical agents*, the most influential is certainly *cold*; particularly when severe in grade, or long applied to any part, or to the general surface. Cold directly depresses the nervous power and benumbs sensation, thereby affecting the nerves themselves; it may also occasion congestion of the nervous centres, and particularly of the veins and sinuses of the spine, and consequently more or less complete forms of paraplegia or general palsy, as in the cases already alluded to.* All applications to the surface of a

* The celebrated SCARRON was deprived of the use of his limbs by prolonged exposure to cold during a fit of

part, that conduct either the animal heat or the electricity from it, may excite paralysis of it, particularly when long continued; as sleeping, sitting, or lying on the ground, or on stones; wet or damp clothes; the continued contact of metallic or earthen substances, &c. Pressure of any kind upon a nerve, whether produced by external substances or by tumours, abscesses, aneurisms, dislocations, or other lesions, in the vicinity of the nerve, or by disease of the nerve itself, or of its neurilemma; and wounds, contusions, or other injuries of one or more nerves, are occasional causes of local palsy. Causes of a similar kind implicating the brain or spinal chord, especially depressions or displacements of the cranial or spinal bones; concussions or other injuries of the cerebro-spinal axis; depending or constrained positions of the head or spine; congestions, tumours, morbid depositions, or other changes, in the nervous centres, their membranous envelopes or bony cases, occasion hemiplegia, paraplegia, or general palsy, according to the seat of lesion, as above assigned. To these may be added intemperance, fatigue or exhaustion, changes of temperature and of the atmosphere, inanition, &c.

162. *b.* The influence of the *mental emotions* in causing palsy is undoubted; but it is not so directly manifested on the brain, in all cases, as may be at first supposed. The emotions, whether exciting or depressing, act primarily upon the heart and circulation, and through them upon the brain and spinal chord. Undue excitement of the imagination, sudden mental shocks, fits of anger, and venereal excesses or masturbation, are not infrequent causes of palsy. Indeed, the several states of paraplegia and general palsy are oftener produced by the last of these causes, or by masturbation, than by any other.

163. *c. Pathological states* or lesions occurring in the course of pre-existing disease, as already stated and sufficiently insisted upon, not only in this article (§§ 34—53.), but also under the heads APOPLEXY (§§ 34. *et seq.*) and BRAIN (§§ 50. *et seq.*), are the most frequent and immediate exciting causes of the several varieties of palsy, in their primary and associated forms. These, in fact, constitute the *chief morbid appearances* furnished by paralytic cases, and consist chiefly of exostosis, tumours, or morbid growths, in the cranial bones (see art. CRANIUM);—tumours, effusions of blood or of serum, fungoid productions, congestions, and the more common consequences of inflammation, of the membranes of the brain;—congestion and inflammation, extravasations of blood, effusion of serum, abscesses, softening, induration, atrophy, ulceration, apoplectic cysts, tumours, tubercles, morbid or malignant productions, aneurisms, hydatids, watery cysts, sloughing or gangrene consequent on severe injuries in parts of the brain; effusions into the ventricles, or between the membranes; disease of the blood-vessels or aneurismal tumours, ossification of the coats of the arteries, varices or dilatations of the veins or sinuses, and coagula, or fibrinous or other concretions, in these vessels, are the chief lesions which have been found in cases of hemiplegia, and of partial palsy of the senses. The changes just particularised, affecting the spine, or the membranes or substance of the spinal chord or medulla oblongata, are the usual causes of the spontaneous cases of paraplegia and general palsy, or those cases which occur independently of the more direct effects of external injuries. The occurrence of these forms of palsy in the course of caries of one or more of the vertebræ, owing either to the extension of inflammation to the membranes, to effusion of lymph or of serum, or to pressure on the chord owing to the acute angle formed by the consequent curvature, is sufficiently familiar to physicians. But *cancerous* or *malignant disease* of the vertebræ, consecutive of cancer of the mammæ, or occurring primarily in these parts, may also occasion paraplegia. Mr. CÆSAR HAWKINS has adduced three interesting cases of paraplegia from this cause, and my friend Dr. ABERCROMBIE, of Cape Town, has communicated to me a similar case to two of those observed by Mr. C. HAWKINS, which had occurred in his practice. In this instance, the breast was greatly enlarged, was quite adherent to the ribs, and its lower surface ulcerated. A prominence was observed in the situation of the second and third dorsal vertebræ, with tenderness on pressure; paraplegia followed by its most unfavourable consequences shortly afterwards took place.

164. *Periostitis*, especially *scrofulous periostitis*, is not infrequently productive of partial palsy, and of paraplegia, or even of more general palsy, when affecting portions of the vertebral column. In these cases, as far as my observation has enabled me to state, the bladder is more or less paralysed, the urine soon becoming alkaline; and neuralgic pains of the limbs are often present to a distressing degree.

165. *d.* Sufficient notice has been already taken (§§ 100. *et seq.*) of the *poisonous substances* which occasion palsy. The slow introduction of mineral poisons, as lead, arsenic, mercury, &c., sometimes is followed by this effect; and in some cases, at least, their influence is exerted as much, if not more, upon the nerves supplying the paralysed limb, as upon any part of the nervous centres. The poisonous effects consequent upon the vegetable or acro-narcotic poisons are owing more to contingent lesions sustained by a part of these centres, whilst they and the circulation in them are under the influence of the poison, than to any effect produced by them on the nerves themselves.

166. VII. OF CERTAIN POINTS IN THE PATHOLOGY OF PALSY.—It is obvious that palsy may arise from two distinct conditions of the nervous centres, viz. 1st from the *suppression*, or *diminished evolution of the cerebro-spinal nervous power and of volition*, owing to interrupted circulation, to depressed vital influence, or to other alterations, in that part of the cerebro-spinal axis which is chiefly concerned in producing or originating that power;—and 2d, from *whatever may prevent the transmission of cerebro-spinal nervous power and volition* from the parts concerned in producing them to the limbs and organs which they actuate.

167. (*a.*) If it be conceded that the grey substance of the brain and spinal chord be chiefly

dissipation. His mental faculties were, however, unaffected, as in most instances of paraplegia, and of general palsy caused by lesion of the spinal chord. The fascinations of his wit were unimpaired; and he became the husband of the beautiful and witty Mademoiselle d'AUBIGNÉ, afterwards the famous Madame de MAINTENON. SCARRON lived 23 years in a paralysed state.

concerned in *originating volition and the other cerebro-spinal functions*, we may readily admit that, when this substance becomes manifestly diseased throughout the convolutions of the brain, a general state of palsy, more or less complete according to the extent of change experienced by it, may be anticipated; and this is actually observed in all cases where the grey structure is extensively changed, more particularly in those cases of general palsy complicated with INSANITY, as shown in that article (§ 235.). In these, the cerebro-spinal functions—the emotions, intellects, volition, &c.—are more or less impaired, and the grey matter of the brain and spinal chord is generally found atrophied, indurated, or otherwise changed, and the structure especially concerned in the manifestations of these powers is no longer in a state capable of originating or developing them.

168. (*b.*) The *transmission of cerebro-spinal nervous power and volition* may be prevented, although they are produced, by injury, disease, or pressure of the medullary substance of the brain or spinal chord, or of the nerves. Most of the lesions adduced when describing the several forms of palsy and their efficient causes, act chiefly by arresting or interrupting the transmission of volition; although, even in these or in other cases, many alterations of structure both interrupt the transmission, and prevent the evolution or the production of nervous power and volition; as when the lesion implicates both the grey and the medullary substance—both the origins and the course of certain nerves.

169. The well known fact that disease on one side of the brain causes palsy of the opposite side of the body, has been attributed to the decussation of fibres in the medulla oblongata. This decussation was supposed to be confined to the anterior columns only. But, although it might account for the crossed paralysis of motion, it could not equally explain the circumstance of paralysis of sensibility following the same law. Sir C. BELL has, however, shown that the middle columns decussate as well as the anterior, and thus accounted for the crossed effect in both cases.

170. It has moreover been objected, that lesions of the *cerebellum* also produce a crossed effect, although this organ is seated above the point of decussation; and that paralysis of the face follows the same law, and arises from disease in the opposite side of the brain, although the nerves distributed to this part also arise above the decussation. As to the first objection, it may be remarked that the dissections of Mr. SOLLY have demonstrated that numerous fibres run between the spinal chord below the corpus olivare and the cerebellum, which he believes to decussate with their fellows of the opposite side, forming in fact part of the apparatus of decussation. But this discovery establishes merely a direct communication between the cerebellum and spinal chord in the immediate neighbourhood of the decussation, without proving the fact of the crossing of these fibres. As to the second objection, it may be answered in the words of Dr. BENNETT, that Sir C. BELL has shown that the fifth pair of nerves arise below the decussation, and Mr. SOLLY has traced one of the origins of the *portio dura* from the fibres he has described, which run between the spinal chord and cerebellum. Thus the sensitive and motor branches of the face ought to follow the same law as the other spinal nerves, which is consonant with what actually takes place.

171. Cases have been recorded, however, in which paralysis has occurred on the same side as the lesions in the brain. Mr. HILTON has endeavoured to explain this exception by referring it to a disposition of fibres in the decussation; but, as Dr. BENNETT has justly argued, there is strong reason for doubting whether disease in the brain ever causes a direct influence; for of the many thousand cases of cerebral hæmorrhage, tumours, &c., which have been recorded, we are acquainted with twenty-one only in which paralysis is said to have resulted from disease in the same side of the brain as the palsied side of the body, and, on analysis of these, more than one half are imperfect and doubtful. As the instances, therefore, of this occurrence are so few, may we not consider that the palsy even in them was produced in the usual manner, and that the lesion which attracted attention had no reference to the complaint? Numerous instances have occurred of abscesses, softening, and other alterations of the brain having been found, but in which no paralysis had been observed during life; and a still greater number are on record, in which there was well marked paralysis, but no appreciable lesion of structure after death. It is by no means improbable, therefore, as paralysis may be induced without leaving any traces, that, in those few cases where the palsy and the lesion in the brain were in the same side, it was really caused by undetected changes in the opposite hemisphere of the brain; and, as is sometimes the case, that the disease found in the hemisphere of the paralysed side had not occasioned the loss of motion.

172. Lesions in the vertebral portion of the spinal medulla produce not a crossed, but a direct effect; and when they interrupt the functions of this part of the nervous system, all the parts furnished with nerves arising from beneath the seat of lesion are affected. Hence the paralysis is the more general, the nearer the disease of the chord is to the brain. But disorganisation has sometimes gradually proceeded to a considerable extent in the spinal chord as well as in the brain, while such fibres or portions of the former as remained unaffected appeared sufficient to perform the limited extent of function which the state or exertions of the patient required. Cases have even been recorded, in which individuals have performed voluntary movements of the lower extremities almost up to the time of death, and yet on examining the chord, it has been found entirely destroyed. Such statements should, however, be received with distrust; for, although the presence of sensibility in the lower limbs may be explained in these circumstances (see §§ 181. *et seq.*), the transmission of volition so as to act upon the extremities cannot be accounted for. It is much more probable, that the lesions observed had taken place chiefly after death, and had only commenced shortly before it; for the spinal medulla when inflamed, and even in health, often undergoes rapid changes after dissolution. We know also that, when the spinal chord is inflamed or is undergoing softening, involuntary, spastic, and automatic movements are produced in the muscles and extremities, that may be mistaken

for voluntary motion, and it will hereafter be shown that, even when extensively diseased and incapable of transmitting the usual acts of volition, various reflected movements of sympathy may be made by the paralysed limbs. Several cases have been recorded, where the spinal chord has been said to have been softened throughout, disorganised, quite diffluent, or even entirely divided, and yet sensibility, and even voluntary motion, have been preserved or but very slightly impaired. The case of DESSAULT, that recorded by M. RULLIER, and others, are of this kind; but they are related with insufficient precision for implicit confidence, and they may, moreover, be explained as just stated, and thus furnish no basis of argument.

173. (*c.*) *The physical conditions of the brain and spinal chord* ought to be taken into consideration in estimating the influence of lesions of these parts of the nervous system, or of their envelopes, in producing paralysis. These conditions are—1st, the bony and unyielding cases enclosing them; 2d, the membranes interposing between them and these cases; and 3d, the fluid interposed between the membranes, especially between the arachnoid and pia mater.

174. *a. The unyielding cases inclosing the cerebro-spinal axis* give rise to several accidents and changes consequent upon external injury, notwithstanding the influence of the membranes, of the processes of the dura mater, and of the fluid interposed between the membranes in preventing them. The pressure, laceration, &c. caused by fractures, depressions, &c. of portions of these cases; the concussions, counter-strokes, shocks, and succussions produced by falls on the back, shoulders, feet, and extremities; the direct pressure following the extravasation of blood, or of serum, the development of tumours, or venous congestion and interrupted return of blood; the counter-pressure consequent upon these changes, and exerted chiefly on parts distant from, or opposite to, the seat of lesion or effusion; and the shock sustained by the vitality and nervous power of the frame, upon severe injury of the nervous centres, should all be taken into the account when we attempt to explain resulting phenomena; inasmuch as they complicate the effects, and render their causes or sources more obscure and doubtful.

175. *β. The physical influence of the membranes* in preserving the nervous masses they inclose from injury and disease is obvious. They support, secure, and protect their contents, whilst they interrupt or prevent the extension of injury or of disease from the external cases to the contained vital parts. Still, when they are themselves the seat of disease, particularly of tumours or of inflammation, the pressure or irritation, or the extension of the disease and its more remote consequences, affect more or less the nervous centres and interrupt or disorder their functions, although the interposed fluid tends to prevent or to lessen these effects.

176. *γ. The cerebro-spinal fluid* interposed between the arachnoid and pia mater, is not merely requisite to the healthy discharge of the functions of the brain and spinal chord, as shown by COTUGNO, MAGENDIE, and TODD, but is also most serviceable in preventing the extension of injury and disease from the bones and membranes enclosing these organs. The motions alone of the spine would be productive of serious consequences, if this fluid, which is more copiously interposed in this part of the nervous system, did not prevent them from materially affecting the chord itself and the roots of the nerves which it transmits. When we consider the effects of this fluid upon the functions of the cerebro-spinal axis, it is impossible not to infer that the quantity of it will vary with the states of the nervous masses and of vascular determination to, or congestion of, them and their membranous envelopes. It may reasonably be concluded that, when these structures and the blood supplying them do not sufficiently fill the unyielding cases of the cranium and spine, the fluid interposed between the arachnoid and pia mater will supply the defect, and prevent the existence of any vacuum, and that, on the other hand, when the states of these centres and of the circulation in them are such as give rise to much fulness, the quantity of this fluid will be diminished. Anæmia will thus be attended by an increase of the cerebro-spinal fluid, and vascular turgescence by a diminution of it, the included masses being thereby preserved from much diminution of pressure in the one case, and from much increase of it in the other. Thus also in cases of atrophy, partial or general, of the brain or spinal chord, the quantity of this fluid is increased, showing the importance of it to the functions of these parts, whilst in cases of hypertrophy it is diminished or almost wanting.

177. It is obvious that in health the presence of a considerable portion of the cerebro-spinal fluid is always necessary to protect the nervous centres with which it is in immediate contact. It is very justly remarked by Dr. R. B. TODD, that by the interposition of a liquid medium between the nervous mass and the wall of the cavity in which it is placed, provision is made against a too ready conduction of vibrations from the one to the other. Were these centres surrounded by one kind of material only, the slightest vibrations or shocks would be continually felt; but when different materials on different planes are used, the surest means are provided to favour the dispersion of such vibrations. The nervous mass floats in this fluid, being maintained *in equilibrio* in it by its uniform pressure on all sides, and the spinal chord is further secured by an additional mechanism, preventing its lateral displacement. The abundance of this fluid at the base of the brain and medulla oblongata protects these parts, the nerves, and vessels, from unequal or excessive pressure and counterpressure during disease, or from accidents; whilst a diminution of it favours or even induces most serious consequences, as shown by the experiments of M. MAGENDIE.

178. From what I have now adduced it may be inferred, that the effects often imputed to the abundance of this fluid, particularly in the spinal canal, by several pathologists, when detailing the morbid appearances after death from diseases of the nervous system, have been imputed to a wrong source; that the serous effusion in these cases, as I have elsewhere argued, is neither the cause of pressure upon, or of induration of, the nervous centres, nor the source of the palsy sometimes observed in these cases; but that it is a result of those changes of the nervous structure and of the local circulation with which it is found

associated, in connection with, or aided by, the unyielding state of the surrounding parts.

179. (*d.*) *Of the influence of the different columns of the spinal medulla and roots of the spinal nerves upon the sensitive and motor powers.* — Since the researches of Sir C. BELL and M. MAGENDIE on this subject, it has generally been supposed that, whilst the antero-lateral columns of the chord convey the motor power, the posterior transmit sensations. Several pathological facts, independently of the experiments of some physiologists, have, however, made it appear doubtful whether or not the power of motion and sensation are severally conveyed through these channels only, and in the precise manner just assigned. There can be no doubt, however, that volition is transmitted along the anterior columns of the chord, the anterior roots of the nerves and the corresponding nervous fibrils, to the muscles which are acted upon; and that sensation generally is conveyed in an opposite direction, namely, from the surface of the body along the sensory nervous fibrils, the posterior roots of the nerves, and the posterior columns of the chord, to the brain. But, although it seems satisfactorily proved, that the acts of volition cannot be fully and precisely performed, unless the channels by which volition is transmitted continue sound or not materially injured, together with the corresponding portions of the fibrous structure of the brain, still it is very doubtful whether or not the posterior columns of the chord are as exclusively devoted to the conveyance of sensation as the anterior are to the transmission of volition. Indeed the cases recorded by various writers, and especially those by STANLEY, WEBSTER, and others, prove either that the lesions observed in the posterior columns of the chord have taken place at the moment of, or immediately after, dissolution, or that sensation may be transmitted through other channels besides these columns, or even independently of the spinal chord itself. That the former of these alternatives cannot be the cause, at least to any considerable extent, is shown by the history of the cases and the nature of the changes which have been observed. It should, however, be admitted that, where softening of the chord is observed, greater doubt may be entertained; for this change, when it has commenced before death, particularly as a consequence of inflammation, will often proceed and extend very rapidly immediately afterwards, so as to be both complete and extensive at the time of inspection. Still, conceding all that may be inferred from this circumstance, pathology furnishes sufficient proofs that sensations may be conveyed to the brain by other channels in addition to the spinal chord, especially when the alterations in the chord rendering it incapable of discharging this function, take place slowly or gradually.

180. Experimental proofs of the existence of these other channels, and evidence respecting them cannot be furnished with the force of demonstration, as, however conclusive experiments performed on the higher animals with the view of furnishing such evidence may appear in the eyes of the experimenter, they will admit of other and often very different conclusions, and the phenomena observed in the lower animals, particularly those which cannot audibly express their feelings, may be ascribed to other causes, or differently explained. We can, therefore, in the present state of our knowledge, only infer from the history of diseases implicating the spinal chord, and from what we know of various inconclusive and not always truly or correctly observed experiments, that changes produced in parts or surfaces of the body may become objects of consciousness, in certain circumstances at least, without the intervention of the spinal medulla; but, as this cannot take place unless the sensation be transmitted by a different channel, it remains to inquire what that channel is, or whether or not various parts of the nervous system may, in certain circumstances, or to a certain extent, perform this function.

181. When we recollect that communicating branches run between the ganglionated or posterior roots of the nerves and the great sympathetic on each side; that ganglial nerves may be traced in their course from the sympathetic into the spinal ganglia and chord on the one hand, and from the latter into the sympathetic and ganglia on the other, we cannot but infer, not only that sensation may be transmitted, or more correctly that impressions on the surface may be conveyed, to the brain so as to excite consciousness, by a different route than that of the spinal chord, especially under circumstances of gradual change in the chord, rendering it ultimately incapable of discharging this function, and that this other route is through the sympathetic nerves and their communications with the posterior roots of the nerves and spinal medulla.

182. The indirect character of this channel may appear an argument to some against the accuracy of this inference; but we know that in cases of obstruction to the usual channels of circulation in the vascular system, very circuitous courses are developed in order to preserve an organ or limb, and the nervous system presents many points of analogy with that system, especially a transmission of sensation from the periphery of the body, and from the several organs and structures to the more central nervous masses, and a similar circulation or return of nervous agency in the form of motion and determinate muscular contraction. The analogy may be further pursued, but the several points are so obvious that they require not even enumeration at this place. Moreover it should be considered that, in respect of sensations excited in any of the abdominal or other viscera, it is very doubtful whether the spinal chord is the channel by which the impressions or changes in the viscera are transmitted to the brain, or whether the sympathetic nerves and communicating branches between the ganglia are the courses which are pursued. Indeed there appears little doubt of the latter being the actual channel of conveyance, for impressions on or changes in the viscera, especially those of digestion and assimilation, are as vividly and as rapidly conveyed to, and made objects of consciousness in, the brain, in cases of injury or even of complete division of the chord, as in sound health.

183. The above considerations may serve as reasons wherefore sensation remains unimpaired, or but little affected, in very many cases where the chord is diseased or injured so as to be incapable of transmitting the impulses of volition, particularly when the lesion is high in the chord,

and when it has advanced slowly or gradually. They may also account for the rare occurrence of entire loss of sensation in any form of palsy of motion.

184. (*e.*) *Congestion of the venous sinuses seated between the theca of chord and the bodies of the vertebræ* has been already assigned as a pathological cause of palsy, or one of the most important changes upon which the paraplegic states of palsy depends. It seldom is found unassociated or alone after death and in the most complete states of the disease, as it generally superinduces more or less extensive changes in the chord and its membranes before dissolution takes place. Several of the more remote causes of palsy act by producing, in the first place, congestion of these *sinuses*, which were even imperfectly described by anatomists until M. BRESCHET directed more particular attention to their structure and connections. But the pathological relations of congestion and of obstructions by fibrinous coagula or concretions in these sinuses have been entirely overlooked.

185. It will soon become obvious to those who make the early phenomena of disease objects of observation and study, that whatever depresses organic nervous power will soon be followed by venous congestion, and when this depression — whether primary or consecutive of nervous or vascular excitement — has been preceded, or is attended, by circumstances producing increased determination to, or fullness of blood in, the capillaries of the chord or its membranes, this consecutive congestion of the spinal sinuses is the more prone to occur. In its primary or uncomplicated states, it seldom produces more serious effects than pain, stiffness, or weakness of the back, loins, and lower extremities, sometimes amounting to incomplete palsy of motion of the latter; often with pain and constriction around the abdomen; and when the weakness or imperfect power of motion is associated with pain, this state is generally confounded with rheumatism or with neuralgia if the pain is severe and follows the course of a nerve, or with an attack of gout when it occurs in the gouty diathesis.

186. Congestion of these sinuses occasions first retarded circulation in the chord and its membranes, subsequently an increased serous secretion or effusion between the membranes. Unless the congestion be very great, it can hardly be expected that it should act injuriously on the chord by pressure, or counter-pressure of it against the posterior parietes of the spinal canal. Still one injurious effect may be produced in this way, particularly when the congestion has superinduced distension of the capillaries of both the chord and the membranes with increased serous effusion between the latter.

187. In these more extreme cases when ulterior changes have taken place, it is not unlikely that *the roots of the nerves* will also suffer from unaccustomed pressure, and, in those cases, the posterior or ganglia ted roots are the more likely to experience it, and paralysis of sensation will be present in a greater or less degree, and even be the more complete, inasmuch as the lesion implicates those parts of the roots of the nerves which communicate with the sympathetic, as insisted upon above (§ 181.). In cases also of caries and angular curvature of the spine, where not only congestion of the vertebral sinuses, but also pressure and counterpressure of both the chord and the roots of the nerves, and even of the nerves themselves as they pass through the spinal foramina, are apt to take place, palsy of sensation is then present, but only in degree proportionate to the extent of pressure on the roots of the nerves, and only in those cases where the nerves or their roots, especially the posterior, are implicated.

188. Congestion of the spinal sinuses, with more or less of the consequences now mentioned, is a frequent attendant upon *fevers*, particularly the more adynamic and congestive forms of fever, occasioning not merely pains and weakness of the back and limbs and incomplete palsy of motion of the lower extremities, but also more or less of the affection of the urinary organs already mentioned (§ 57.). Many of the cases described as spinal irritation, of hysterical neuralgia, of uterine irritation, &c., actually are instances of congestion of the spinal sinuses, occasioning remote or sympathetic phenomena in addition to those which are more strictly local. These are often removed or partially relieved for a time by the natural recurrence of the catamenia; *but*, when more extensive or severe, or when associated with suppression of this discharge, they sometimes lapse into paraplegia or partial palsy, especially when neglected or injudiciously treated, owing to an increase of the congestion or of its consequences.

189. (*f.*) *Various sympathetic phenomena occur in connection with paralysis*, especially with the paraplegic states of the disease, that require particular notice. Some of these admit of different explanations, and thus have been differently accounted for, both by former and by contemporary writers. Of these the *reflex motions*, which sometimes are observed upon irritating the surface of a paralysed limb, have attracted most attention, and have directed the researches of physiologists more particularly than heretofore to the structure and functions of the *spinal chord*. These researches are fully noticed in the article on the pathology of this part of the nervous centres, with my opinions respecting them; and I therefore need no further advert to them at this place, than to remark, that the phenomena which Dr. M. HALL has assigned to a reflex function of the spinal chord were fully recognised by WHYTT, but not explained by him as occurring independently of sensation. He, however, believed that the power of feeling was not limited to the brain, but was extended to the spinal chord. PROCHASKA afterwards more correctly appreciated the true source and relations of these phenomena; and, in the articles CHOLERA, CHOREA, CONVULSIONS, &c., in this work, the characteristic symptoms of these maladies were explained, and ascribed to reflex actions excited in the voluntary muscles by irritations transmitted to the roots of the spinal nerves and spinal chord. Subsequently to the publication of these articles, Dr. M. HALL's researches appeared. He referred these phenomena to a special organisation of the chord; and his opinion received the support of Mr. GRAINGER, Mr. NEWPORT, and others, although opposed by some eminent anatomists. The structure of the nervous system in the class *articulata* is the chief circumstance that can be adduced in favour of the existence of a spinal organisation for reflex actions in the higher ani-

mals. But reflex actions — phenomena which I denominated many years ago (1824) "*reflex sympathies*" — are performed not only by the spinal chord, but also by the *brain*, and by the *organic or ganglial nervous system*.

190. α. As respects the *brain*, no sooner are the impressions on the senses made objects of sensation or consciousness than they are reflected upon, or treasured in the memory, and, either instantly or at some future period, excite to action. The manifestations of life through the medium of an encephalon are the phenomena to which the term *mental* has been usually applied; which consist chiefly of impressions on the senses, rendered objects of consciousness and of reflection by this organ, and which subsequently are recombined, compared, &c., and thus often become causes of volition. Many of the impressions on the senses are so strong as instantly to impel to action, without any intermediate state of reflection; or, in other words, the actions or volitions are so instantaneously consequent upon the impressions and impulses, that the intermediate reflections are not made objects of consciousness, or are not remembered. This is especially the case when the impressions on the senses excite the passions, and when the individual has been habituated to act upon them without allowing, or being capable of, intermediate reflection. These reflex actions, even when not directly proceeding from impressions on, or reports of, the senses, are nevertheless the results of such impressions or reports, received, remembered, or reflected upon, at some antecedent period.

191. β. The reflected actions of the *spinal chord* may occur, as Dr. M. HALL has shown, independently of sensation, although sensation often attends, or is excited by the impressions which occasion them. They may even be so morbidly strong as not to be controlled by the will, when the individual is most conscious of their presence, as in tetanus. The reflected actions of the *ganglionic nervous system* are only objects of consciousness when they are excited by powerful stimulants or irritants.

192. Thus there may be said to be *three classes of reflected actions*, viz., 1st. that class of actions which may be denominated *psychical*, or *cerebral*, or which results either directly from impressions made upon the senses, or indirectly or reflectively from these impressions: — 2d. that class which may be termed *animal* or *spinal*, which proceeds from impressions or irritations transmitted to the spinal chord or roots of the spinal nerves, and is reflected thence by the motor nerves to voluntary muscles, and which may occur independently of the brain: — and 3d. that class which is *organic* or *vital*, which takes place in parts supplied only or chiefly by the ganglial system, and which is independent of both the brain and spinal chord.

193. γ. There are several circumstances connected with the *voluntary actions as involving consciousness*, to which further allusion may be made. The actions which occur during sleep when the mind is incapable of perceiving impressions made on the senses unless they be inordinately intense, to which the terms *somnambulism*, sleep-waking, sleep-walking, &c. have been applied, are merely the result of suggestions arising out of previous or recollected impressions and reflections; these suggestions and reflections giving rise to volitions which excite the voluntary organs to action without awakening the senses or permitting the perception of external objects in a distinct manner. Somnambulists may perform any of the common occupations of life, or may even execute difficult intellectual tasks with much ability, — I have seen them compose, sing, play on musical instruments, &c. according to their respective tastes or occupations, and be still unconscious of the various surrounding objects of sense. Consciousness, however, of the act which the somnambulist is performing, and of objects connected with it, undoubtedly exists for the moment, to the abstraction of every other sensation. In this state the suggestions, mental operations, and the resulting actions, are often perfectly performed, as respects the ability of the individual; but, as they commence and are continued during a state of the brain unfavourable to sensation and perception, they are faintly, or not at all recollected. The concentration also of the mind on the subject engaging it, still more completely prevents other objects from being perceived. The somnambulist, in fact, *acts* his dream, and often in such a manner as to enable him to shun the dangers attending the action, as completely as if he saw them distinctly and thus avoided them. And yet there is reason for believing that they are not seen by him, but avoided from the circumstance of his having followed an accustomed and well-remembered track, each successive part of which is suggested to him as he proceeds, just as a person passes through a room in the dark, avoiding all impediments in his way from his recollection of their positions.

194. δ. Many of the above remarks apply to *dreaming*, and in part also to the *motions of the body in sleep*. Dreaming may, or may not, be attended by movements of the body; but these are generally imperfect or partial, if observed at all, and have reference to the idea passing in the mind. In this case the mental suggestion either fails of exciting precise and corresponding actions and expressions, or excites them so partially or imperfectly as not to amount to somnambulism. The chief difference between dreaming and somnambulism is, that the individual during a state of sleep, or whilst the senses are closed against perception, — or rather whilst the brain is incapable of perceiving the impressions made upon the senses in their usual states of intensity, — not only dreams, but also actually executes what he dreams, without awaking from the state of which I have just defined sleep to consist.

195. But the motions of the body during sleep are often independent of dreaming, or of those sensations and suggestions which pass through the mind during sleep, and which are faintly remembered afterwards; for obscure sensations may be excited for the moment by external objects or physical causes during sleep, although they are not at all recollected. A person turns or moves whilst asleep, owing to a feeling of uneasiness, which, although not remembered by him when awakened, has nevertheless been produced so as to cause the change of position. These movements have recently been adduced as instances of reflex actions occurring independently of sensation; but, that momentary sensation has not been excited, is not established. Even in experiments showing the occurrence of motion after the removal of the cerebral hemispheres, the non-existence of sensation is not demonstrated, inasmuch as sensation

has not been proved to be limited to these hemispheres, nor even to exist in them; they having to perform other functions, of which the sentient principle, presiding most probably in some other part, as in the medulla oblongata or in its vicinity, takes due cognisance.*

196. *e. Catalepsy* is a state altogether opposed to the foregoing, — is the most complete and general state of palsy of motion that can exist without terminating existence; but it rarely continues longer than some hours, although it may recur after short intervals, lasting on some occasions for many

* The following observations on the *Forms and Modes of Sensibility* were published in 1824, among my Physiological Notes, already referred to in various parts of this work. They may serve to elucidate many of the phenomena which occur in several states of paralysis.

The phenomena considered by several authors as evincing the existence of *sensibility*, are referrible only to contractility, with which all classes of animals are endowed, and which, in the lowest orders and in some vegetables, assume the appearance of sensibility. In these latter, however, we have no reason to infer the presence of sensibility, merely because they contract under the influence of a stimulus; for the contraction may take place without the existence of this property, from the effect produced by the stimulus upon the organisation of the contracting part. Indeed, we cannot suppose that sensibility is present where the parts generally observed to be instrumental in its production are not found to exist: a sensation cannot be supposed to be produced where there is neither an organisation suitable to receive, nor a channel to convey, nor an organ to perceive, an impression. We should, therefore, limit this term to those phenomena which the mind perceives or is conscious of when in a state capable of exciting perception or consciousness.

With this limitation, *sensibility* may be called the function of sensation, and a property peculiar to the animal kingdom. The sensations are derived through the medium of the senses, and of the nerves which communicate with the encephalic centre. On this centre the existence of sensibility chiefly depends; the ramification of its nerves, or the subordinate portions of it, being also parts of the apparatus requisite, but not giving rise, to this property. As we ascend in the scale of creation, and as the senses and organs of volition present a more intimate connection with this nervous mass — the encephalon, — so sensibility becomes more perfect, until in man it reaches an extent greatly surpassing that of other animals.

In man, and perhaps in the more perfect animals, the *modes* of sensibility seem to vary. These modes may, however, be divided into *two conditions*, as they are more or less active; namely, *conscious* or *active sensibility*, and *inconscious* or *passive sensibility*: the former relates to those impressions, either from within or from without, which give rise to perceptions or ideas; the latter to those that are frequently produced upon the senses and upon the ramifications of the nerves, and, owing either to habit or the want of due attention to them, are not perceived by the mind. In this latter mode of sensibility, the organ receiving, and the channel conveying the impression, perform their offices; but the mind either is not, at the time when the impression is made, in a state to receive it, or receives it so imperfectly, from its weakness or its transient nature, as not to give rise to consciousness.

This mode does not necessarily imply a difference in the degree of sensibility, but the condition in which this property exists, owing either to its being more excited by other impressions, or to its being exhausted at the time when the impression is made. This condition is one to which the highest manifestations of sensibility as well as the lowest may be occasionally subject: it is, however, merely a relative mode of this property; and the relation subsists entirely between the state of the cerebral organ which perceives, and the force and duration of the impression made upon the organ of sense. Thus, when the sensibility is actively occupied with a particular object, and an impression is made at the same time upon a different organ from that through which the perception with which the mind is engaged was conveyed, the second impression may affect the senses in an evident manner, and even so as to influence volition, yet we may be unconscious of its operation, and no active perception may result from it. If, however, the second impression be stronger or more vivid than the first, or if, from various other circumstances, it should excite the cerebral functions, active sensibility or consciousness is the result.

As sensibility, according to this view of the subject, is, in its active state, a term merely expressive of consciousness; and as this faculty is evidently dependent upon the cerebro-spinal nervous system, especially on that more complex part of it which holds relation with surrounding objects; and, also, as we have no reason to attribute the possession of this part of the nervous system to the very lowest orders of animals, particularly to the class Radiata, — so we must conclude that, although sensibility is a property of animal life, its higher grades are not possessed by all animals. It may be also stated, that *active* sensibility, being thus considered as expressive of, or comprising, consciousness of sensations, and of the intellectual and moral operations, varies in its extent throughout the animal kingdom, according as those manifestations are more or less numerous and perfect. How far the *passive mode* of sensibility, or that unattended by consciousness, may be a property of the lowest orders of animals, is difficult to say. We may, however, infer, that as this latter condition of sensibility may take place without an active exertion of this property in the highest animals, so it may result from a less perfect endowment of sensibility in the lower; and as this mode may require a less complex apparatus for its production, inasmuch as its relations are more simple, so it may be possessed by animals whose organisation and manifestations do not permit us to conclude that they are capable of evincing sensibility in its more perfect and active conditions. The relations which this form or mode of sensibility holds with the numerous instincts of animals, must be evident to all who consider the subject. The relations, however, which evidently subsist between that form of sensibility, called *organic sensibility* by BICHAT, and the animal instincts, are much more numerous, more intimate, and more apparent.

Organic sensibility refers to those sensations which are produced in different degrees of intensity, owing to the existence of certain conditions of those viscera which are immediately subservient to the preservation of the individual and the species — to nutrition and reproduction, and which are not immediately subjected to the influence of volition. The conditions of the parts exciting organic sensibility are very various, and are the result of irritations arising from the presence of a stimulus, of unnatural actions supervening in particular systems or textures, and of the deficiency of that stimulus or influence to which particular viscera have been accustomed. Many of the changes preceding this class of sensations seem to interest, in the first instance, the ganglial class of nerves; but, owing to the intimate relation subsisting between this part of the nervous system and the voluntary or sentient part, the impression or change is propagated to the brain. This is the only essential difference which exists between this and the other forms of sensibility. It is the brain which perceives in them all; and although stimuli, or the defect of stimuli, may give rise to certain phenomena possessing the characters of the higher manifestations of this property in the organs appropriated to the preservation of the organic system, independently of the sensorium, — consciousness, or the more perfect form of sensibility, cannot form part of the results.

Organic sensibility may also be *active* or *passive* — it may or it may not be attended with consciousness; and even the unconscious mode of it may indirectly impel to action, or give rise to many of the manifestations or instincts which characterise the lower animals, owing to the ganglial centres, either from their organisation or connexions, or from both, performing a greater extent of function than usually falls to their share. If, therefore, the passive form of organic sensibility may propel to action without consciousness, or the sensorial sensibility being excited, in those animals, we may also account, in the same manner, for many of the instinctive functions being performed when we cannot trace them to the influence of a cerebral organ. Of all the conditions of sensibility, the active organic form is the least under the control of the mental powers. It also, in all its modes of existence, more intimately interests the existence of the individual than the other forms of sensibility, — organic sensibility involves a feeling in all its active manifestations instinctive of life or death.

From this it will be readily seen how close a connexion exists between organic sensibility and the animal instincts; it does not, however, belong to my plan to trace the connexion in all its relations.

Of sensibility generally we may observe that, in the human species, it is very variable, even in health; in some persons it is very much exalted, in others very obtuse. It is vivid in early life and in youth; after the age of manhood it gradually diminishes; as old age advances it decreases rapidly; and, in persons who have attained a greater age, it is present in the lowest grade in which we find it in the species. Its morbid conditions — in respect both of grade and kind — form or characterise many of the most important diseases of the human œconomy.

hours. In this state, the muscles of voluntary motion—even those of the face and the eyelids—will not contract upon irritating them, nor will they be influenced by the will of the patient, which is generally attempted to be exerted when consciousness is not altogether abolished. The sensibility, indeed, is generally not lost during the attack, although it is more or less obscured in most cases. In a patient who is liable to attacks of this complaint, and whom I have often seen during their continuance, the eyelids and all the voluntary muscles retain the positions in which they are placed; but not the least appearance of contraction is manifested upon the most energetic irritation. Still this lady feels, sees, and hears during the continuance of the seizure. She even wills the action of the muscles; but volition is not transmitted to them. The voluntary muscles of respiration are generally the first to act upon the return of voluntary power. In another case which I had an opportunity of observing during the attack, the sensibility was somewhat more diminished than in the foregoing; but I have not met with an instance of its entire abolition. The sphincters are always unaffected in this disease. The respiratory movements are slight, and perceived with difficulty; the impulse of the heart is weak, and the pulsations generally accelerated and soft, but sometimes slow or irregular.

197. (*g.*) *Mechanism and functions of the spinal chord.*—There are other phenomena beside those already mentioned, which occur in paralysed limbs, and which deserve a brief notice at this place:—Dr. M. HALL and Dr. BUDGE have shown that, in cases of paraplegia where sensibility as well as motion is lost, convulsive motions are produced in the paralysed limbs by tickling the soles of the feet, and even on defecation and micturition. But it is doubtful whether sensibility is entirely lost in these cases; the occurrence admitting of explanation in the manner stated above (§ 181. *et seq.*), and still more readily, if the minute anatomy of the spinal chord, according to the researches of STILLING, VAN DEEN, and BUDGE, be taken into the account. The chord, according to these researches, consists, first, of perpendicular fibrils, forming the white substance of it; secondly, of transverse fibrils, and of very delicate longitudinal fibrils, constituting the cineritious or grey substance of the chord; the transverse fibrils crossing at right angles, and forming a net-work with the longitudinal both of the grey and of the white substances; thirdly, of corpuscles, of an angular form, with nucleated or projecting processes, scattered in groups through the anterior grey matter only, and most numerous at the origin of the anterior roots of the nerves; fourthly, of transverse fibres passing directly from the posterior to the anterior grey substance of the chord.

198. The roots of the nerves are direct prolongations of the grey substance. Fibrils pass from the grey, through the white substance, into the roots of the nerves. Dr. STILLING traced fibrils from the posterior roots to the anterior grey masses. And fibrils, almost as soon as they enter the chord, run between bundles of fibrils of white substance to join other bundles of fibrils from adjoining nerves. Others, in fasciculi, form loops with fibrils coming from the next nerve; and others appear as continuations of the transverse ray-like fibrils of the posterior grey substance, while the connection of the anterior roots with the anterior grey substance is still more distinct. The nucleated processes or corpuscles of this substance are in immediate connection with the primitive fibrils of the roots of the nerves.

199. The afferent properties of the posterior, and the efferent properties of the anterior divisions of the chord, are rendered more manifest by the above results, at which the above-mentioned anatomists have arrived. But, according to Dr. STILLING's experiments, the longitudinal fibrils of the anterior white substance do not transmit volition to the nerves, this office being performed by the longitudinal fibres of the anterior grey substance. As the transverse fibrils are prolonged into the nerves, and as we know that the posterior nerves are necessary to sensation, so it may be inferred that the posterior transverse fibrils are excitors of the posterior longitudinal fibres of the grey substance, and that a sensation, or rather the sensative impression, is transmitted by the posterior transverse fibrils, and by the longitudinal fibres, to the sensorium; the same relations, *mutatis mutandis*, being conceded to the anterior grey fibres. As centripetal impressions pass from the sensitive nerves along the transverse and longitudinal fibres of the posterior grey substance to the brain, so centrifugal impressions may pass in a contrary direction, that is, from the brain along the longitudinal and transverse fibrils of the anterior grey substance to the roots of the motor nerves.

200. Such being the mechanism of ordinary sensation and motion, according to the recent researches of STILLING, VAN DEEN, BUDGE, and others, it can be no longer difficult to account for those involuntary movements which are produced in a paralysed limb when the surface of it is irritated, pinched, or tickled, and which have been termed by Dr. M. HALL reflex actions, depending, according to him, upon a reflex function of the spinal chord, which function he refers to a distinct mechanism in the chord. It has already been contended by the author that no such mechanism exists, and that these actions are sympathetic, and result from the conformation of this part of the nervous system, transverse fibrils passing, as shown by the anatomists just referred to, directly from the posterior to the anterior grey substance, to convey impressions from the sensitive fibrils and to excite the roots of the motor nerves. That no appropriate and peculiar structure exists in the chord for the purpose of performing these sympathetic or reflex movements, beyond what has now been noticed, is the opinion not only of the author, but also of the writers already mentioned, as well as of many others who have investigated the subject.

201. Dr. M. HALL has contended that the spinal chord is the source of muscular irritability, and that this irritability is exhausted by volition. In proof of this position he states that paralytic limbs are more readily agitated by galvanism and strychnine than sound limbs, when the cause of palsy is in the brain; the paralysed muscles being in such cases more irritable than natural, whilst they are less irritable when the palsy proceeds from the state of the chord. The irritability is thus considered to be increased in the former case, owing to its not being exhausted by volition, and

to be diminished in the latter owing to the lesion affecting its source. But experience shows the inaccuracy of this inference, for the paralysed muscles, in cases of cerebral paralysis, are not more irritable than the sound muscles, but on the contrary less so, as tested by voltaic electricity; and DR. PEREIRA has come to a similar conclusion. In the article IRRITABILITY, I have adduced my views, as promulgated many years ago, respecting the source of this property — have stated that it proceeds from and depends upon the organic or ganglial nervous system; and have contended that it does not arise from the spinal chord and nerves, although it is rendered more energetic and perfect in the voluntary muscles by the supply of nerves which they receive from the chord. The truth is, that the tone, rigidity, and irritability of all paralysed muscles are more or less impaired — the less so when the lesion is in the brain and high in the chord. Still it cannot be doubted that strychnine or nux vomica affect these muscles more readily and more remarkably than the sound muscles. These facts may be explained partly by referring to the minute structure of the chord, and partly by the circumstance of this substance being rapidly absorbed and acting energetically on the structure of the chord and origins of the spinal nerves.

202. The fact that mental emotions often excite parts which are paralysed, is also explained by the mechanism of the chord, and by the circumstance so strongly insisted upon by BICHAT, but since so much overlooked, that mental emotions powerfully affect the ganglial and sympathetic nerves, and, through them, the spinal chord and the nerves proceeding from it, the sympathetic nerves communicating freely with the chord and roots of the spinal nerves, and contributing numerous fibrils to the latter to be distributed with them to the parts they supply.* That volition, when continued or energetic, exhausts the irritability of voluntary muscles, is admitted; and hence the sense of fatigue, lassitude, and even of soreness or pain, which often follow such exertion.

203. (*h.*) *The relaxation of the sphincters*, occasionally observed in palsy, especially in paraplegia and general palsy, has been viewed as a phenomenon of more general occurrence than it really is. The fact is, that the sphincters are not so frequently relaxed, as they are imperfectly influenced by the will, or are not at all affected by it. They still retain much of their tonicity, but volition is not so energetically exerted on them as to counteract the actions of the hollow viscera, when these viscera are excited by an accumulation of their respective contents, or by medicine. The *tonicity* or power of the sphincters has been attributed entirely to the spinal chord, and without reference to any influence they may derive from the organic or ganglial nervous system. But, although they derive a share of their power, more especially the voluntary increase of power as circumstances may require it, from the cerebro-spinal axis, their continued state of tonicity is chiefly to be attributed to the organic system of nerves. This is shown in paraplegia and in general palsy, in both which the sphincters very often retain a natural condition of contraction; but that contraction is frequently not increased by volition so as to resist the actions of the bowels or urinary bladder. In some cases of these states of palsy, the sphincters are not much affected, especially when the palsy is incomplete, or seated high in the chord. Pathological evidence, indeed, clearly leads to the inferences,—1st. that the power of the sphincters is attributable chiefly to the organic nervous system, but that it is increased by volition exerted through the medium of the spinal nerves, especially in circumstances requiring such increase, as when the disposition to the actions of the bowels or bladder has to be resisted, and 2d. that it is chiefly this latter influence, or that which is exerted through the spinal chord, that is either lost or impaired, in cases where the voluntary contractions of the sphincters are insufficient to prevent the passage of the excretions when the patient wishes to retain them. It is not, therefore, to be inferred that where there is insufficient control over the evacuations, the sphincters are either relaxed or materially deficient in power; but that they are only insufficiently influenced by volition, relatively to the power which overcomes their natural tonicity.

204. VII. TREATMENT OF PALSY.—There is no disease which more requires an intimate study of its nature and relations, before a determination should be formed as to its treatment, than the one now under consideration. The seat, grade, pathological condition, and constitutional peculiarities, of paralytic maladies are so diversified, that each case should be made a separate study, and such means only as are appropriate to existing pathological conditions ought to be employed. I shall endeavour — 1st. to point out the plans of treatment which are most serviceable in the principal forms, states, and complications of palsy; and 2d, to appreciate the character and value of the numerous medicines and methods of cure which have been recommended for this disease, and their applicability to the several conditions in which it comes before the physician.

205. i. OF PARALYSIS OF SENSATION. — The means to be employed in this form of the disease should be selected with strict reference to the remote causes, to the pathological conditions inferred to exist in each case, and to the particular circumstances of the individual. If this affection occur in a spare habit of body, if it be unconnected with general or local vascular plethora, and if it have been caused by cold or other depressing agents, the means about to be recommended for the more chronic states of paralysis of motion (§ 213, 214.) may be employed, especially local stimulants and irritants, internal excitants, external derivatives, galvanism, &c. In all cases, however, the strictest attention should be paid to

* The views published by the Author in 1822, in the *London Med. Repository*, and, in 1824, in his *Physiological Notes, &c.*, respecting the independent and distinct constitution of the organic or ganglial class of nerves, as to the functions and relations of this part of the nervous system, and as to the influence exerted by this system on the vascular system on the one hand, and on the cerebral system on the other, — in short, the positions thus taken, from researches in various classes of animals, that all organs and parts which are necessary to the life of the individual animal, and to the perpetuation of its species, are supplied by ganglial or organic nerves in proportion to the importance of each organ, and to the activity of the several organic processes, — have been recently fully confirmed by the researches of STILLING, BIDDER, VOLKMANN, WALLACH, HANNOVER, R. LEE, and others.

the several digestive, secreting, and excreting functions.

206. If the *senses* of *sight, smell* or *taste*, are singly or generally affected, the same principles of treatment should be adopted as are here exposed in respect of *anæsthesia*; the several means being selected or modified according to the peculiarities of the case, and the organ especially disordered.

207. Local congestions are concerned in producing many, probably the majority of cases of *anæsthesia*. If the loss of feeling be associated with hesitation or other affection of the speech, these conditions may be more confidently inferred; and if the anæsthesia be hemiplegic, a limited congestion, hæmorrhage, or softening of some part of the brain, probably exists. When anæsthesia occurs in plethoric and robust habits of body, in persons who have lived fully, or of sedentary habits, or consecutively of suppressed evacuations or discharges, then these pathological states most probably exist, and the affection, if not quickly removed, will often soon be followed by paralysis of motion. In these circumstances, the treatment advised for the acute states of palsy of motion, especially general and local vascular depletions, chologogue and other purgatives, and derivatives, is that which is most appropriate. Subsequently external excitants, as sinapisms, vesicants, urtications, &c., or the other means noticed for the more chronic states of palsy (§§ 213. *et seq.*), may be prescribed. When anæsthesia is associated, as it generally is, with loss of motion, the treatment is in all respects as about to be stated with reference to palsy of motion, which is then the most important phenomenon, and the one which should chiefly engage attention as respects its immediate cause.

208. ii. TREATMENT OF PALSY OF MOTION, &c. — When the faculty of motion is paralysed either alone or conjointly with partial or more complete palsy of sensation, the treatment should be directed with the same intentions as have been just mentioned, viz. — 1st, with the view of removing the morbid states or the structural lesions inferred to exist in each case which may present itself; and 2dly, with the object of restoring the transmission of nervous influence to the paralysed muscles.

209. *A. When the palsy is strictly local or partial*, the treatment should necessarily depend upon the peculiar features of the case. In this state of the complaint (§ 21.) the lesion may be either in the origin or in the course of the nerve supplying the paralysed muscles; but it may also be limited to the ramifications of the nerve, as when the affection is caused by the continued influence of cold, &c. If the lesion be inferred to exist at or near the origin of the nerve, local depletions, derivatives, alteratives, especially a carefully regulated course of mercury or of the iodides, with sarsa, &c.; external irritants and drains; and a due promotion of the several secretions and excretions, comprise the most efficient means of cure.

208. If the nerve have its functions interrupted by changes in any part of its course, as by thickening of the periosteum, by abscesses, tumours, &c., alteratives, particularly the iodides with the solution of potash and sarsaparilla; various external applications, particularly the tincture of iodine, or solutions of the iodides, the plaster of ammoniacum with mercury, &c., and other means suited to the nature of the case may be resorted to — if the ramifications of the nerve be chiefly affected — and particularly if colds have been the cause of the disorder, sinapisms, blisters, or applications containing capsicum or mezereon, may be prescribed, and if these fail, the part may be stimulated by either of the means hereafter to be mentioned (§§ 249. *et seq.*).

210. *B. The Hemiplegic form of Palsy*, whether occurring *primarily* and *simply*, or *associated* with apoplexy or convulsions, or appearing *consecutively* of these, is the most common form of the disease, and requires the greatest discrimination in estimating the pathological changes and in prescribing the means of cure. — *a. In the acute or early period of the malady*, prompt and decisive measures are generally required; yet these should be varied according to the mode of accession and character of the attack, as already noticed (§§ 35—40.). If the complaint approach in the *gradual manner* above noticed (§§ 35, 36.), alteratives and derivatives are chiefly indicated with the view of removing or arresting the lesions which may be inferred to be the causes of the complaint, and of allaying the irritation they may be supposed to occasion. Local depletions, especially by cupping on the nape of the neck; sinapisms or blisters in this situation and behind the ears; purgatives and alteratives; setons in the nape, and mustard pediluvia, are severally indicated. In this form of palsy, vascular depletion, unless local and moderate, is seldom of much service. Purgatives are generally required; and mercurials, in alterative doses and combinations, especially PLUMMER's pill with soap, or the bichloride of mercury, in small doses, taken either soon after a meal, or with preparations of sarsaparilla, sometimes either ameliorate the symptoms, or arrest for a time the further progress of the disease. It is in this form of hemiplegia that the iodides are more particularly indicated. I have given the iodide of mercury, or PLUMMER's pill, nightly, and the iodide of potassium with solution of potash and compound decoction of sarsaparilla during the day, with manifest advantage, a seton being kept open in the nape of the neck.

211. When the attack of palsy seems consequent upon *inflammatory softening of a portion of the brain, &c.* (§§ 37, 38.), local vascular depletions, or even general blood-lettings, are manifestly required. Active purgatives and mercurials are also requisite; and, in the intervals between the exhibition of purgatives, the bichloride of mercury should be given in small and frequent doses, until the gums become affected, external derivation being also produced by the usual means, whilst the head is kept cool and elevated. In this form of the disease, I have not seen any advantage accrue from the iodides, especially in the *early or acute stage*, or whilst inflammatory action continues to exist. In other respects, the treatment in this variety of the disease should be conducted as advised for inflammation of the brain. (*See art.* BRAIN, §§ 191. *et seq.*)

212. If hemiplegia occur in a *sudden manner* (§ 39.), the treatment should be as prompt and energetic as in cases of apoplexy. In many cases, particularly in robust and plethoric persons, copious general or local blood-letting, or both

general and local, is required; and either one or the other, or even both, may be again necessary some days after the accession of the attack, owing to the vascular reaction consequent upon it and the previous depletions, or attending the inflammatory action produced by the extravasation of blood causing the seizure. In this form of palsy the pulse should be carefully watched during the first fourteen or twenty-one days after the accession of the symptoms; and as soon as it acquires fulness or hardness, blood-letting, according to the circumstances of the case, should be repeated. But, in order to prevent the necessity of recurring to depletions, purgatives, external derivatives, and refrigerants or cooling diaphoretics, should also be prescribed at the commencement of the attack. In this variety of the disease I have seen much benefit derived from the bichloride of mercury, either alone, and taken soon after a meal, or with sarsaparilla until the system became affected by it; but vascular depletions should be premised, and the secretions and excretions duly promoted. In this state of the malady, as well in that which is *associated with*, or *immediately follows, the apoplectic seizure* (§ 40.), the treatment in the early or more acute stage is in every respect similar to that which I have recommended in the article *Apoplexy*, when that malady is attended or followed by hemiplegia. (*See art.* APOPLEXY, (§§ 146. *et seq.*)

213. *b. The chronic or persistent state of hemiplegia* is seldom altogether removed. The injury received by the fibrous structure of the brain in the great majority of cases, is such as admits not of the restoration of the complete power of volition over the paralysed limbs. In this state, setons or issues may be tried, but they should be kept discharging for many weeks before much advantage can be expected from them. At the same time the iodides, particularly the iodide of potash, may be exhibited either alone or with liquor potassæ, or as already recommended; and the bowels should be kept freely open by means of chologogue purgatives.

214. During this period of the disease, various internal and external stimulants and irritants have been advised with the view of accomplishing the *second indication of cure* (§ 208.); but the selection of them requires great discrimination, as regards their respective properties and the existing pathological conditions. The preparations of nux vomica, strychnine, &c., have been recommended in this state of hemiplegia, but I have rarely or never found them of service in this form of palsy; but, on the contrary, productive of more or less mischief, especially whenever increased determination or fulness of blood in the head was present. They are indicated only when an opposite state of the cerebral circulation is inferred to exist, and in some other forms of the disease. The same may be said of the use of other internal stimulants, when a disposition to increased vascular action or effusion exists in the substance and membranes of the brain; for, in such cases, the preparations of iodine, aconite, cantharides, serpentaria, phosphorus, camphor, electricity, galvanism, &c., of which more particular notice will be taken hereafter, are very rarely of use, but often injurious. The remarks which I shall have to offer respecting certain modes of cure, and various medicines more or less praised for this complaint, apply so entirely to this period of hemiplegia, that I shall add no more at this place as to the means which may be further employed in the treatment of it.

215. *C. The treatment of paraplegia* so entirely depends upon the nature of the lesion producing this form of palsy, that a continual reference to such lesions must be had in the observations which I shall have to offer on this subject. I have stated above (§ 53.) the several changes causing paraplegia; and it will be seen that these require a treatment appropriate to each individually. — *a.* It is obvious that the means required for paraplegia consequent upon *concussion* or *fracture* of the spine, or upon *laceration* of, or *pressure* on, the chord by displaced bone, are chiefly surgical, at an early period; and that the selection of these means should depend upon the peculiar features of the case and the extent of local injury. At a later period, when the palsy still continues, the treatment will necessarily hinge upon the physical condition of the parts and the presumed consequences of the lesions immediately resulting from the injury. In such cases the paraplegia sometimes persists, although the physical condition of the spine appears but little or not at all altered. In these it may be presumed, that softening, effusion, or some other consequence of inflammatory action is present in the chord or its membranes; and consequently these cases come under the same category as others about to be considered (§ 216.).

216. *b.* In cases of paraplegia which commence with severe pains or tenderness in the spine or loins, or with a sense of heat or burning, followed by spasms, numbness, and loss of power, indicating an *acute* or *inflammatory character* (§ 56.), a decided antiphlogistic treatment is requisite, especially at an early period. In these, cupping on each side of the spine near the seat of pain or tenderness, repeated according to circumstances, mercurial purgatives and terebinthinate enemata, are the most efficient remedies, especially when these symptoms have not been of long duration. If pain or spasms still remain after a due recourse to these means, calomel or other mercurials should be given with opium until the mouth is slightly affected, attention being paid to the states of the urinary bladder and bowels, and of their excretions.

217. In cases of paraplegia of a more insidious character—in those which occur gradually and slowly, or which are consequent upon exposure to cold, or are attributable to congestion of the spinal sinuses, to increased serous effusion, or to chronic lesions affecting the chord, or to scrofulous changes in this part, its envelopes, or vertebræ, the bichloride of mercury as exhibited above (§§ 211, 212.), or conjoined with the compound tincture of bark; or the iodide of potassium with liquor potassæ and the fluid extract of sarsa, or an alternation of these; stomachic purgatives; warm salt water baths followed by active friction of the trunk and limbs, and strict attention to the excreting functions and to the states of the discharges, are the measures which have proved most beneficial in my practice. The bichloride of mercury, or Plummer's pill, should be exhibited until the gums are affected, or until recovery takes place; and, when the motions are tar-like, and are procured with difficulty, calomel should be given with active cathartics, such as

the compound extract of colocynth, scammony, &c., sometimes quickened with a drop of croton oil. Blisters or rubefacient applications may be placed on the back, and be repeated according to circumstances. The *liniments* prescribed in the *Appendix* (*Form.* 308. 311.) may be applied as *embrocations* in the course of the spine, from time to time, or be rubbed assiduously in this situation.

218. Setons or issues on each side of the spine have been advised, and in some instances have proved serviceable, particularly when aided by a judicious internal and constitutional treatment, but they require discrimination in respect both of the pathological causes of the paraplegia, and the general health of the patient. When the disease appears to have proceeded from exhausting causes, as masturbation, venereal excesses, &c., or to have been aggravated by these, then setons or issues are generally injurious, especially when the constitutional powers are much exhausted. Stimulating and invigorating measures are required in all such instances. In these and similar cases I have found the tincture of the sesquichloride of iron with the tincture of cantharides; the compound galbanum pill with the sulphate or oxide of zinc; the aloes and myrrh pill with the resinous extract of nux vomica; and the valerianate of zinc lately introduced by Mr. J. SAVORY, of more or less service. Sir B. BRODIE recommends a grain of the sulphate of zinc to be given three times a day, increasing the dose, and to be washed down by a draught containing twenty minims of the tincture of cantharides. In cases of this nature, the preparations of iodine, particularly a weak tincture, or the compound tincture of the pharmacopeia; or small doses of the bichloride of mercury in the compound tincture of cinchona and tincture of capsicum, or an alternation of these, have been of essential benefit. Sir B. BRODIE makes favourable notice of the bichloride of mercury in doses of one-sixteenth of a grain, three times a day, with a moderate dose of the tincture of cantharides; I have tried this mode of exhibiting the bichloride, but the effects should be watched. The compound tincture of camphor will be conjoined with these two medicines with advantage.

219. *D. The treatment of general paralysis* in most instances is much the same as that just recommended for paraplegia; for the former generally depends upon similar lesions to the latter, or is merely an extension of it.—*a.* When the general palsy is a symptom of the more violent states of *apoplexy*, the means appropriate to these should be prescribed (*see art.* APOPLEXY, § 135. *et seq.*). When it is the result of *concussion* of the brain, or of the spinal chord, or of *fracture* or other *injury* of the cervical vertebra, the treatment must depend upon the violence of the shock, on the presence of the primary symptoms, or the supervention of reaction—on the state of the heart's action and of the circulation, both locally and generally, and on various circumstances which will influence the experienced physician. The intentions of cure should therefore be not only varied but different, or even opposite in different cases and circumstances.

220. *b.* In cases of general palsy from *caries* of the cervical vertebra, after the acute symptoms have been removed by local depletions, blisters, mercurials, &c., issues, setons, or moxas, &c. should be placed at a little distance from the seat of lesion; and an embrocation, consisting chiefly of the compound camphor and turpentine liniments, placed from time to time along the spine. In the case of caries of two of the cervical vertebra referred to above (§ 68.), the treatment consisted of active mercurial and other purgatives, of an alternation of a short course of the bichloride of mercury dissolved in the compound tincture of bark, with a more prolonged course of the iodide of potassium and solution of potash, with the fluid compound extract of sarsa. A protracted discharge was procured by means of blisters and savine ointment, applied to each side of the neck just below the occiput. The recovery has been complete. The neck, however, is shorter and much stiffer, obviously owing to absorption and anchylosis of the diseased vertebræ.

221. *c.* When the general palsy is of an *acute* character, or is caused by inflammatory congestion or by any of the more immediate consequences of inflammation of the membranes or substance of the chord, then local depletions near the seat of pain, and the prompt use of mercurials, of blisters, or of the terebinthinate embrocation in the course of the spine, and of the other remedies recommended above (§ 216.) for paraplegia should not be neglected.

222. *d.* When the disease is *chronic*, or has been neglected, or has not yielded to these means, then the bichloride of mercury, the sulphate or the valerianate of zinc, the iodide of potassium, the tincture of cantharides, the tincture of capsicum, &c., may severally be employed as already advised (§ 218.). Indeed, the treatment of general palsy, in its several forms, is in every respect the same as that advised for paraplegia.

223. iii. PARALYSIS IN CHILDREN should be treated according to the principles above developed, and with strict reference to the presumed pathological condition. If the palsy be *partial* or *hemiplegic*, and be inferred to have arisen from injury during parturition, or apparently *acute*, the application of a leech behind the ear (of the unaffected side in the hemiplegic variety), and repeated doses of calomel should be prescribed. Minute doses of the iodide of potassium may be given subsequently, and the bowels ought to be kept freely open. If the palsy be congenital and independent of injury, the iodide of potassium or the iodide of mercury, or the bichloride of mercury, may be tried in minute doses and with due caution. In the more *chronic* cases of infantile paralysis, these constitute the chief remedies, but they should be continued for a considerable period and gradually increased, a course of the one being alternated with that of the other, as already advised.

224. If the infant be able to take the breast, recovery to some extent may be expected, although it may not be complete. I have at present under my care a patient in a fit of gout, aged between forty and fifty years, who was hemiplegic from earliest infancy, but he is unable to state whether it was congenital or caused by injury during parturition. The limbs of the paralysed side are considerably smaller than those of the sound side, and their movements weak, difficult, and constrained. The imperfect growth of paralysed limbs in infancy is owing chiefly to the very imperfect use made of them during the epochs of development.

225. iv. TREATMENT OF SHAKING PALSY.—Amendment has not followed any mode of cure which I have tried, and I have tried the most energetic means for this form of palsy, when it appears *gradually* and in a *chronic form*. When, however, the tremor occurs in a more *acute form*, or consecutively of suppressed evacuations, in strong or plethoric patients, as in the case adduced from FRANK (§ 99.), or when it is attended by pain in the head or in the course of the spine, then antiphlogistic remedies, particularly local depletions, blisters, or the terebinthinate embrocation in the course of the spine, purgatives, mercurials, &c., followed by the iodides, the bichloride of mercury, or the valerianate of zinc, and a seton in the nape of the neck, may be severally employed, according to the peculiarities of the case; or other energetic means about to be noticed may be tried.

226. In all cases of *paralytic tremor*, the existence of an arthritic or rheumatic diathesis should be ascertained, and the treatment modified accordingly. In such instances, tonics, opiates, and antispasmodics, with ammonia or other alkaline substances, may be prescribed. When the disease has probably arisen from masturbation or excessive sexual indulgence—the most frequent of its causes—then the preparations of iron with the tincture of cantharides or of capsicum, or with camphor, or with the nitro-hydrochloric acids; or the extract of nux vomica, or opium conjoined with aromatics may be tried, according to the peculiarities of the case, and to the effect produced; and they may be aided by stimulating embrocations or plasters applied on the spine, as the *liniments* in the *Appendix* (F. 308. 311.), or the emplastrum thuris comp., &c. &c.

227. v. PARALYSIS CAUSED BY POISONS requires a treatment appropriate to the nature of the deleterious agent.—*a*. When the affection is caused by the preparations of *lead*, the state of the digestive organs first requires attention. (*See art.* COLIC FROM LEAD.) After the alvine secretions and excretions are more or less improved, and their discharge is rendered more regular and healthy, the preparations of *nux vomica* or *strychnia* may be exhibited, but their effects should be carefully watched. In this disease I have preferred the resinous extract of nux vomica to strychnia, and have generally prescribed it in combination with the purified extract of aloes. In aid of these, the external stimulants hereafter to be mentioned, suitable exercise of the paralysed parts as far as they may admit of it, and the application of splints extending from the elbows to the fingers in cases of palsy of the wrist or arm, should not be overlooked. In addition to friction with various stimulating substances, electricity and galvanism, warm salt-water bathing, and warm baths containing stimulating substances, may be employed. Cleanliness and the removal of the cause always should be enforced. During the treatment the regular discharge of the alvine functions ought to be promoted, and the patient should be allowed a generous diet.

228. *b*. The states of palsy caused by other poisonous substances should be treated conformably with the principles already explained—with strict reference to the states of vascular action and vital power, both general and local. The tremulous form of palsy sometimes caused by *mercury* (see ARTS AND EMPLOYMENTS, § 23. *et seq.*) requires similar means to those just recommended for palsy from lead. This observation also applies to the palsy of the extremities sometimes produced by *arsenic*. In all these, internal stimulants, tonics and restoratives; attention to the digestive and defæcating processes; external excitants, electricity, &c., and nutritious diet are requisite.

229. Palsy consequent upon *narcotic poisons* should be treated according to the states of vascular action and nervous power. After due recourse to their respective antidotes, &c., local depletions, purgatives, external derivatives, &c., in order to remove congestion of the nervous centres, should be prescribed, and, if the malady still persists, the several alterative, restorative, and stimulating remedies recommended for the *chronic states* of palsy ought to be employed according to the peculiarities of the case, and the circumstances of the patient.

230. vi. The TREATMENT OF THE COMPLICATIONS OF PALSY requires but few remarks; as the most important of these complications is duly considered in the articles on the diseases of which palsy is a part, or of which it is consecutive. Under the heads APOPLEXY, INFLAMMATION OF THE BRAIN, and INSANITY, the associations of paralysis with these are fully discussed.—*A*. I have already noticed *that palsy may either follow or precede inflammation of the nervous centres*, and have explained how this may arise (§ 125.). Hence it is requisite to watch carefully all cases, especially of hemiplegia, where it is inferred that the palsy is caused by extravasation of blood, particularly during the first three or four weeks of the disease; and, upon the first indication of inflammatory irritation to have recourse to antiphlogistic measures co-ordinately with the indications for their use. The evidence of inflammatory action in the vicinity of the lesion producing paralysis, at whatever period it may appear, as described above (§ 128.) is a sufficient reason for the having recourse to local depletion, purgatives, external derivatives, and alteratives, and for relinquishing tonics, stimulants, or excitants of any kind, should those have been resorted to.

231. *B*. The *complication of insanity with general palsy* admits of little or no hope even of partial benefit. Still the alteratives already noticed, combined with tonics and restoratives, should be prescribed, particularly the iodide of potassium with sarsa or with bitter infusions; the extract of nux vomica with aloetic or other aperients; the bichloride of mercury with the compound tincture of cinchona; the valerianate of zinc and other means already noticed (*see art.* INSANITY, § 444—446.). In the association of palsy with *puerile imbecility*, or with *idiotcy*, the case is hopeless, for the reasons assigned above (§ 127.).

232. *C*. The treatment of *disease of the cranial bones*, or of the *vertebræ associated with palsy*, may be said to have been already noticed (§ 217.), since the same means as have been advised for the more chronic cases of paraplegia or of general palsy are also appropriate to this complication. In the more common cases of this kind, namely, in those where the vertebræ are diseased, but little can be done with rational hopes of success, beyond what has been recommended above (§§ 217. 220.). But in the course of treatment, the intercurrence of inflammation of the membranes or

even of the chord itself should be guarded against and watched for, and be promptly opposed by the means already indicated (§§ 216. 221.)

233. *D.* The *association of palsy with neuralgia or rheumatism*, or with pains resembling these affections, should always lead to the suspicion of congestion, or inflammatory action, of or near to the origins of the nerves which are the seat of pain, or which supply the pained parts; and when the palsy is moreover complicated with *spasms* or *cramps*, the same lesions should be inferred, and a treatment based upon the inference be prescribed.

234. *E.* I have already contended that the *association of palsy with disease of the kidneys and urinary organs* is most frequent and important; and that the latter morbid condition, even when it is apparently the primary one, is generally only the consequence of congestion of the vertebral or spinal sinuses, causing pressure on the chord, or increased effusion into its sheath (§§ 184. *et seq.*). In these cases, the urinary functions may be disordered to a most serious extent, or even for a long time, before symptoms of paraplegia are evinced, or the movements of the limbs are materially affected. When the spinal congestion interrupts or otherwise changes the functions of the kidneys, the consecutive excrementitious plethora may occasion either hemiplegia, or coma with general palsy. In some cases, the congestion of the spinal veins and sinuses is soon followed by acute congestion, or inflammation of the kidneys, or by suppression or retention of urine, paralytic symptoms not appearing until the renal malady is far advanced. In these circumstances the treatment is obvious. Cupping on the loins, or near the part of the spine chiefly affected, according to the severity of the attack and the habit and constitution of the patient, should always be directed, and afterwards terebinthinate embrocations ought to be applied to the loins and spine.

235. *F.* The nature of the occasional connection of *palsy, especially paraplegia, with hysteria*, has been already noticed (§§ 140. 188.). The irregularities often observed in the urinary functions of hysterical patients may often be attributed to the irritation propagated from the uterus and ovaria, either directly by the ganglial nerves to the kidneys and bladder, or indirectly to the spinal chord, and thence to the urinary organs along the nerves communicating between them and the chord. In those cases where the protracted irritation of the uterine organs, in connection with exhaustion of nervous power, disorders not only vascular action in these organs, but extends itself and its effects upon the vascular system, not only to the spinal chord, but also to the urinary organs, pain or aching in the loins, and even tenderness on pressing the spinous processes of the vertebræ, are often observed: and, if the vascular disorder consequent upon the local excitement or irritation advances far, so as to occasion certain of its most prominent effects, numbness, cramps or spasms of the lower extremities; retention or suppression of urine, sometimes alternating with an unusually large secretion or flow of it; occasional nausea, vomiting, and irregularity of the bowels; irregularity, or difficulty, or suppression of the catamenia; and, ultimately, even more or less complete paraplegia may result. Several cases of this kind have occurred to me, and have long resisted treatment until they were submitted to energetic courses of the alterative medicines above advised (217.), particularly the bichloride of mercury, or the iodide of potassium, variously combined, aided by terebinthinate enemata and embrocations, by the extract of nux vomica, and by such of the remedies already mentioned as were most appropriate to the peculiarities of the case. In the remarkably severe and prolonged instance noticed above (§ 139.), for which all the usual means had been exhausted, in addition to several of the means now noticed, a pea-issue was made in the inside of each thigh, and kept freely discharging until the amendment was complete. The recovery was rapid in this instance, and the lady is now in the enjoyment of good health.

236. *G.* I have met with several instances of *palsy, and especially of hemiplegia, associated with visceral disease.* The connection between organic disease of the heart and hemiplegia, as that between the former and apoplexy, is sufficiently obvious; and neither it, nor the treatment of the complication, requires much comment, inasmuch as our remedial measures should be directed primarily to the cardiac lesion, and subsequently or collaterally to the paralytic affection; the states of these lesions, in connection with the age, habit of body, &c., of the patient, controlling the plan of treatment and the choice of means.

237. *H.* The *complication of palsy with hepatic disease* has been observed by me on several occasions: the palsy being generally hemiplegic, and the right side being that affected in nearly all the cases I have seen. Although in some cases the liver has appeared to have been primarily affected, still it is very probable that the loss of power in the voluntary nerves and muscles of the right side may have in some degree affected the functions and circulation of the liver, and, in prolonged cases, ultimately induced disease of it. In these associations the principles of treatment and the choice of medicines will readily suggest themselves to those who have perused the foregoing remarks, and what I have adduced on the treatment of diseases of the liver.

238. Palsy may, moreover, be associated with *scorbutus*, and it not unfrequently occurs in the *gouty or rheumatic diathesis*, more especially after irregular, displaced, or suppressed gout. In these circumstances, the treatment should be varied according to the diathesis. In the gouty association of the malady, the usual means should be employed to develope the gout in the lower extremities.

239. vii. THE APPRECIATION AND APPROPRIATION OF REMEDIES FOR PALSY.—In discussing the treatment of the several forms of palsy, it has been, as will be seen above, a principal object to advise the use of such means as appear the best calculated to remove the morbid changes upon which these forms severally depend; and mention has been made chiefly of those remedies which seem to me most likely to produce this effect, and of which I have had more or less experience. It is necessary, however, to a full exposition of the treatment of palsy, to review the application of the more energetic means to certain states of the disease and of the constitution, and to notice other medicines which have been favourably mentioned by writers of reputation.

240. After devoting due consideration to the *seat* and *nature of the lesion* of which palsy is the

prominent and most manifest phenomenon, it next is of importance to estimate correctly the states of vascular action and of nervous and vital power—to ascertain, as nearly as may be, how far the affection may be considered, from these states, in connection with its cause and duration, to be *acute* or *chronic*, and *sthenic* or *asthenic*. These terms, it is true, are merely conventional; but they nevertheless assist us materially in our attempts at briefly indicating the conditions of the patient which powerfully influence the operation, and which should therefore guide our choice of medicinal agents for this malady.

241. *a.* Of *bloodletting*, general and local, it may be briefly stated, that they are generally required early in attack, especially in acute and sthenic cases, and more particularly in the hemiplegic or sanguineous form of the disease. In the paraplegic and partial states of the malady local bloodletting is commonly to be preferred to general; and in all cases the quantity, as well as manner and repetition of the depletion, should depend upon its effects, the state of the pulse, and habit of body of the patient, as well as upon the predisposing and exciting causes of the attack. We must not, however, inconsiderately prescribe either venesection or cupping in all cases even of hemiplegia, because we find them to have been advised by CELSUS, ZACUTUS LUSITANUS, HOME, ABERCROMBIE, and many other eminent writers. The most recent of these writers recommends it too profusely, too generally, and too exclusively, at least as regards the inhabitants of large cities and manufacturing towns, wherein the causes of the malady and the asthenic states of a very large proportion of those attacked either admit not of depletions, or require very different or even opposite means of cure. During the treatment of both hemiplegic and paraplegic palsy, intercurrent inflammatory action may appear, and require, generally, depletions by cupping or leeches; and the physician should be alive to such an occurrence when he has recourse to stimulating medicines, in doubtful circumstances, and in young persons.

242. *b.* Of *evacuants, purgatives* and *diuretics* are the most appropriate; and of the former of these, the most active should be selected, and such as influence most energetically the principal secreting viscera, as calomel, colocynth, jalap, scammony, &c. In paraplegia, and even in hemiplegia, the bowels are very torpid, and require repeated and full doses of these, and even of still more energetic cathartics, as croton oil or elaterium, in some obstinate cases. In many, recourse should also be had to purgative enemata, particularly to those in which the oleum terebinthinæ is an ingredient. It is not merely necessary regularly to evacuate fæcal matters by means of these, but to employ them so as to derive from the cerebro-spinal axis any increased flow of blood to it which may have occasioned or prolonged the attack. Indeed, with these conjoined objects, they are advised by HALLÉ, DALBERG, BRODIE, and others who have insisted on their use.

243. The ancients advised a recourse to *diuretics* in palsy, and some of the medicines prescribed by modern physicians, and considered by them to influence the disease merely as stimulants, owe no small share of their good effects to their operation on the kidneys. Of these, the most efficient are the tinctura lyttæ, the preparations of iodine, and spirits of turpentine—substances of which further notice will be taken hereafter—which require caution in their use, and which are suited chiefly to chronic and asthenic cases, and to the paraplegic states.

244. *c.* Of *alteratives*, the most beneficial and most generally appropriate are *mercurials, iodine* and the *iodides*, and *sarsaparilla*.—(*a.*) *Mercurials*, employed so as to affect the system, and chiefly by inunction, have been recommended for palsy by SCHENCK, SCHNEIDER, CAVALLINI, and J. P. FRANK; and, both internally and externally, by VALLISNERI, BURGER, and many others. I have seen them of service, when judiciously prescribed, in both hemiplegic and paraplegic palsy. J. P. FRANK prescribed them more especially for saturnine palsy, in which he has seen them of great service. In acute and sthenic cases, calomel given with antimony, after bloodletting until the pulse is sufficiently reduced, should be preferred; afterwards, the milder mercurials may be substituted; and, in chronic and asthenic cases, the bichloride may be given in the decoction of bark until the gums are slightly affected, especially in scrofulous and rheumatic constitutions. I lately attended a patient in hemiplegia (Mr. G., of Watling Street,) for whom I prescribed the bichloride of mercury, in this combination, a frequent recourse to purgatives, and a seton in the nape of the neck, with the best results. His right side was affected, and he now can walk unaided, and write letters and cheques as usual.

245. (*b.*) I have prescribed *iodine* and the *iodides* in several cases of the various forms of both partial and general palsy; but in no case of the disease have I ventured to employ them otherwise than in very small doses at first, carefully watching their effects, and cautiously increasing the doses. Dr. MANSON was the first who published cases of palsy in which iodine had been employed; and these cases show not only the good effects of this substance in certain states of palsy, but also its injurious influence in the more acute and sthenic cases, and when prescribed in too large doses. Dr. MANSON employed only the tincture of iodine; but, both before and after the publication of his cases, I had used both this and the iodide of potassium for this disease, as well as for some others, in public and private practice; and more recently the iodides—the iodide of potassium and the iodides of mercury—more frequently than the pure iodine. These preparations, especially the last, are best suited to the more chronic and asthenic cases, or after depletions and other evacuants have been pushed sufficiently far. Even then the doses should at first be small, and the effects upon the pulse be carefully watched. The occurrence of headache ought to cause an interruption in the use of these medicines. The iodide of potassium may be conjoined with liquor potassæ and sarsaparilla, commencing only with one or two grains, and gradually increasing it. I have even given only one grain in the twenty-four hours with advantage.

246. *d. Stimulants* and *tonics* were employed internally for palsy much more frequently by the older writers than by physicians of the present day, who are more conversant than they generally were with the true seat and nature of the lesion causing the paralytic attack. These substances are contra-indicated in all acute and sthenic cases

of palsy, and whenever there is reason to infer the existence of inflammatory irritation. Hæmorrhage, or vascular extravasation, or even of active congestion, whilst they may be employed with reasonable hopes of benefit in chronic and asthenic cases, and when the disease has appeared after exposure to cold or to other depressing influences, or has followed exhausting causes.

247. (*a.*) Of this class of medicines the resinous *extract of nux vomica* and *strychnine* have been more frequently employed than any other in recent times. Of the two preparations, my experience induces me to prefer the former, as more manageable than the latter and equally efficacious. I have usually prescribed it in conjunction with purgative or aperient extracts. It, as well as other internal stimulants, should never be given in palsy, especially hemiplegia, when the pulsation of the carotids, or the temperature of the scalp, is at all increased; and, if the pulse become strong or frequent, or the face flushed, during its use, it should be discontinued, and local depletions, with an antiphlogistic treatment and regimen, instantly adopted. It is most serviceable in paraplegia and in lead-palsy.

248. (*b.*) The flowers of the *Arnica montana* were much praised, and is still much used in Germany and Denmark for paralytic cases. It has received the commendations of ANGELI, DE MEZA, CONRADI, AASKOW, and others; but I am not aware of any other British physician beside HOME who has given it a trial, and his evidence is not much in its favour. The *Rhus radicans* or *Toxicodendron* has been recommended in this disease by BRERA, DESGRANGES, VAN MONS, KOK, and ALDERSON; but ZADIG considers it quite inefficacious. A decoction of the *Chenopodium ambrosioides* has been advised by RUDOLPHI, BALDINGER, and LENTIN; *serpentaria* and *capsicum* by FALCONER; *guaiacum* by FOTHERGILL and JOHNSTON; *ammoniacum* by BOURGET; *pyrethrum*, internally, by OXLEY; *cajuput oil*, both internally and externally, by PEREBOOM and THUNBERG; *naphtha* by RAMAZZINI; *camphor* dissolved in turpentine by SCHUMACHER; this substance dissolved in naphtha by REICHSANZEIGER; *musk* by TRUENER, LŒFFLER, and others; *castor* by PAULI; the tinctura *lyttæ*, internally, by VAUGHAN, MAY, BRISBANE, &c.; *phosphorus* dissolved in æther, internally and externally, by BRERA and GAULTIER-CLAUBRY; and the *nitrous oxyde gas* by BEDDOES, HILL, and PINEL. It is very probable that these may severally prove of service when judiciously prescribed, especially in those circumstances of the disease to which I have above (§ 246.) limited the use of stimulants and tonics. In the same category *aconite* may also be noticed; it having been recommended by STŒRCK and GREDING; also *opium* and *belladonna*, which have, severally, been used by STOLL, THOMANN, and others, in palsy from lead.

249. The circumstances which admit of the internal use of stimuli also allow a recourse to *electromotive agencies*, in the several forms in which they have been employed; and, in no disease have they been more generally and more empirically resorted to than in this. *Electricity*, in the form of shock, bath, sparks, &c., although chiefly prescribed by persons ignorant of medicine, has received the cautious sanction of VANDER BELEN, HART, and others, in the most chronic and asthenic cases. MEYER, BANG, and PERCIVAL advise it chiefly for paraplegia and lead-palsy; and they, with STOLL, DE HAEN, QUARIN, and FALCONER, doubt its efficacy in other circumstances. The *electro-galvanic* influence was first recommended by VOLTA in this disease; and it was soon afterwards adopted by WALTHER, HALLÈ, MARCUS, and GRAPENGIESSER for those cases in which powerful stimulants seemed to be required.

250. *e.* The numerous means, which may be strictly called *external*, and which have been so generally resorted to in this disease, operate either (1), by rousing the circulation and exciting the nervous influence in the part, as simple or medicated friction; (2), or by deriving irritation or other morbid action from the nervous centres to superficial parts, as issues, setons, &c.; (3), or by a combination of these modes of operation, as blisters, sinapisms, urtication, &c. These means are severally appropriate to most of the forms of palsy; and, when judiciously selected, they may be safely used in the various states and relations of the disease.

251. (*a.*) *Frictions* in a simple form, although advised by STOLL and HILSCHER, are seldom employed; for some medicinal substance with which frictions may be used is requisite to impart confidence to the patients in their efficacy. However, they may be advantageously employed by means of the hair-glove, or of the kheesha or Indian glove. Frictions of the palsied limbs with various stimulating substances, as with phosphorus dissolved in oil or ether; with camphor, soap and turpentine; with cajuput oil, camphor, olive oil, &c., have been often advised; and may in a few instances prove of service.

252. (*b.*) *Issues and setons* are upon the whole the most efficacious modes of permanent external derivation in palsy; and the most generally adopted, especially in this country. The former may be made in the scalp itself, by incisions in or near the occiput, peas being afterwards inserted; the latter may be worn in the nape of the neck. They have been praised by POTT, APPLETON, LATOUR, SCHREGER, PRICHARD, and LODER; and I have had several occasions of witnessing their good effects. *Moxas*, which have been for ages employed in the East as the usual mode of external derivation, have been strongly insisted upon by LARREY and others in this and other diseases, and have been much employed on the Continent of Europe; but their superior efficacy to issues or setons is very doubtful. The *actual cautery*, mentioned by PAULUS ÆGINETA and others of the ancients, has been recommended also by RICHTER, PORTAL, and J. P. FRANK. NERI NERII, a Neapolitan physician of the sixteenth century, directed it to be applied to the occiput in hemiplegia. Amongst the usual means of derivation, *dry-cupping*, mentioned by CELSUS and others in this disease, should not be overlooked.

253. (*c.*) *Blisters*, kept discharging for a considerable period, or frequently repeated, as advised by BOERHAAVE, FORDYCE, and DICKSON; or *artificial eruptions*, produced for a longer or shorter period, by means of tartarized antimonial ointment, or by croton oil, are also frequently of service both in acute and chronic cases; but in the former especially, after local depletions and

evacuations have been freely practised. The same remark is applicable to the use of *sinapisms* and to a frequent recourse to *urtication*, which has been advised by PAULUS ÆGINETA, MUYS, HOME, HUFELAND, and many others, or to *embrocations* containing capsicum or its tincture or pyrethrum, all which exert the double effect noticed above (§ 250.), when applied to the paralysed limb, as they should generally be applied, unless in cases where the sensibility and temperature of the paralysed limb are morbidly increased, as sometimes observed; and then they may even prove injurious, especially in asthenic cases. In these, also, blisters applied to the palsied limb may be followed by sloughing.

254. *f. Simple* and *medicated* and *mineral warm baths* have been much praised in palsy. But it is obvious from the nature and forms of the disease that, although they may be of service in some instances, they may be injurious if inappropriately or indiscriminately employed. I have seen them of service in chronic and asthenic cases, and in those states of the disease caused by exposure to cold. Medicated warm baths — with warm and aromatic substances — were most beneficial in a case of general palsy arising from this cause that came under my care. J. P. FRANK notices favourably simple and sulphureous warm baths, and states that those of Baden have been of service in some obstinate cases of chronic palsy. In recent, acute, or sthenic cases he justly dreads the use of warm baths, whether simple, mineral, or medicated, as he has known apoplexy supervene where they had been injudiciously prescribed. The sulphureous thermal baths of Baden were recommended by STOLL chiefly in lead-palsy after electricity had been employed. It may be noticed further, that the warm mineral springs of Bath, Toeplitz, &c., have been frequently resorted to by paralytic patients, and sometimes with more or less advantage, when neither general nor local plethora or congestion exists, or when opposite states of the vascular system obtain; that sulphureous warm baths have been favourably noticed by BAKER, SUMMERS, TOLBERG, WAITZ, and HUFELAND; that aromatic and spiced warm baths were recommended by RIEDLIN; warm salt water baths by REIL; and even warm chalybeate water-baths by GRAEFE, in this malady.

255. *g.* The *diet and regimen* in palsy should depend entirely upon the peculiarities of the case. In most cases of hemiplegia, in all acute and sthenic cases, or whenever general or local plethora is inferred to be present, both the diet and regimen should be strictly antiphlogistic; a farinaceous and vegetable diet, with simple diluents only, being adopted. In chronic, asthenic, and anæmic cases, light, digestible animal food may be allowed; but in every instance, the predisposing and exciting causes should be viewed in connection with the pathological conditions, and all these should be duly estimated, before either the *treatment*, or the *diet*, or the *regimen* is assigned. The chief part of the regimen in all cases is the careful avoidance of the *causes* (§ 157. *et seq.*) of the disease.

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PAROTID GLAND — DISEASES OF. — This gland is often the seat of inflammation, of congestion, of scrofulous enlargement and inflammation, and of several other structural lesions. It is liable to be variously affected by the ingesta, whether alimentary or medicinal; and it is often the seat of symptomatic disease, particularly in the course of those maladies which reduce vital power or contaminate the blood. The diseases of the parotid may be divided into — 1st, the *functional*; 2d, the *inflammatory*; and 3d, the *structural*.

I. FUNCTIONAL DISORDERS OF THE PAROTID GLAND.

CLASSIF. — I. CLASS, I. ORDER (*Author*).

1. These disorders have received but little attention from medical writers; for, unless in a few prominent cases, they seldom attract attention, and even in these they are generally *symptomatic* of some more important malady to which a primary and principal attention should be paid. The functional disorders of the parotid consist chiefly of *excessive* and *diminished* secretion. Doubtless, an alteration of the *quality* as well as of the *quantity* of the secretion often obtains, but the latter change is more obvious, whilst the former can be inferred chiefly from the deposits formed from the salivary fluid, either in the ducts or upon the teeth; or from the action of chemical re-agents, which, according to M. DONNÉ, evince more or less of acidity in inflammatory diseases, with an increase of the animal elements. (See art. SALIVA.)

2. i. DEFICIENT SECRETION OF THE PAROTIDS arises from numerous circumstances and agents affecting the digestive organs or the constitutional powers. Great mental anxiety; heating articles of food, condiments, and beverages; general vascular excitement; and morbid states of the blood, may diminish or altogether arrest the action of the parotids and other salivary glands. Irritation or inflammation of the stomach, or of other digestive organs, sometimes has a similar effect; and numerous stimulating, astringent, and anodyne medicines impair the action of these glands, although in a very uncertain and capricious manner. Deficiency of the salivary secretion also generally attends most fevers and inflammatory diseases, more especially those fevers in which the blood is early contaminated; and in the more malignant maladies, when the action of the parotids is arrested, the glands themselves become swollen and tender. The secretion of these glands is generally diminished in diabetes and diseases of the kidneys. (See arts. SALIVA and SALIVATION.)

3. ii. INCREASED ACTION OF THE PAROTIDS often arises from the ingestion of various articles of food, condiments, and medicines; but when it is caused by food or condiments, it is generally transient and slight. It is often very remarkable and prolonged when caused by medicine, especially by mercurials; and it is usually more moderate and irregular when it is symptomatic of other diseases, as of affections of the pancreas, or of the stomach or duodenum, &c. Seeing, however, that the functions of the parotid are generally affected co-ordinately with those of the other salivary glands, whether quantitatively or qualitatively, they will be more particularly considered in relation to diagnosis and prognosis, under the heads SALIVA and SALIVATION.

II. INFLAMMATION OF THE PAROTID GLANDS.

SYNON. — Παρωτις (from παρα, near, and ους, the ear), Galen; *Parotis*, Vogel, Sauvages, Pinel; *Parotitis*, Darwin; *Cynanche Parotidæa*, Cullen, Parr; *Angina externa*, Russel; *Empremà parotitis*, Good; *Cauma parotitis*, Young; *Oreillons, Parotide, Ourles*, Fr.; *Entzundung der Ohrdrüse*, Germ.; *Parotite*, Ital.; *Mumps, Branks, Inflammation of the Parotid.*

CLASSIF. — 1st *Class*, 2d *Order* (*Cullen*). 3d *Class*, 2d *Order* (*Good*). III. CLASS, I. ORDER (*Author*).

DEFIN. — *Pain, tenderness and swelling in the situation of one or both parotids, with symptomatic fever, occurring either sporadically, endemically, or epidemically.*

5. i. CAUSES and HISTORY. — *A.* Parotitis is most frequently observed in children, and about the period of puberty; and but rarely after twenty-five or thirty years of age, in an *acute form*, although it sometimes occurs in advanced life as a chronic disease. M. BEGIN thinks that it is more frequent in children of the male than of the female sex. It proceeds, *sporadically*, from cold conjoined with humidity, and from currents of cold air. It is sometimes so prevalent in cold and humid localities, especially during the colder months, as to be *endemic*; and it is occasionally *epidemic* in extensive districts. When thus prevalent, it has appeared in many instances to have been propagated by *infection*, particularly in schools and in ships, &c., where a single case has frequently been followed by very many; but in these circumstances, the propagation of the complaint may be imputed to exposure to the same physical agents and atmospherical states; although the removal of a boy from a school in which the disease prevailed to a locality where it was unknown, and the subsequent infection of other children by the one removed, militate against these agents having been the cause, and evince an infectious property. I have seen two instances of the disease appearing in nurses whilst tending on persons affected with erysipelas of the face and scalp, and in both these the adjacent cellular tissue was much implicated. One or both glands may be affected; and, when the disease is epidemic, the maxillary glands are often similarly diseased. The accumulation of morbid secretions or of fæcal matters in the *prima via*, evidently favours or predisposes to an attack of the complaint. Epidemic parotitis very rarely attacks the same individual a second time. In scrofulous persons, simple or sporadic parotitis

often assumes a modified character, and becomes chronic or prolonged. It not infrequently follows scarlet fever and other exanthematous fevers, and then assumes a very severe and troublesome form, particularly after scarlatina, the inflammation often extending far into the adjoining cellular tissue and to the lymphatic glands of the neck.

6. *B. Symptoms.*—*a.* The *invasion* of the complaint is usually indicated by irregular chills or rigors, followed by lassitude; pain and tenderness, with stiffness in the neck; frequency of pulse; heat of skin; difficulty of mastication, owing to swelling and pain in the situation of one or both parotids; occasionally a somewhat increased flow of saliva; slight difficulty of deglutition, more or less increased when the adjoining glands are affected, and by the usual attendants on symptomatic fever, as thirst, loss of appetite, costiveness, headache, &c.

7. In some cases the symptoms are even milder than now stated. The swelling, pain, tenderness, and tension are slight; the pulse is but little affected; and the organic functions are not materially disturbed. From this state of extreme mildness every grade of severity occurs, until the disease assumes much more intense characters, both locally and generally. In these latter the swelling is great, not merely in the situation of one or both parotids, but extends to the sub-maxillary glands, sometimes also to the tonsils, and to the adjoining cellular tissue. In these cases there are generally much heat and sensibility of the parts, often with more or less redness, and always with difficult mastication and deglutition, owing to the great tumefaction. There are also acute symptomatic fever, with urgent thirst, loss of appetite, severe headache, flushed countenance, &c.

8. *b.* The *duration* of the complaint varies much in the *simple* and *sporadic form* of the disease; beginning to subside in four or five days in some cases, and continuing to increase during a longer period, or passing into suppuration in others. When it follows the eruptive fevers, especially scarlatina, or when it occurs in the scrofulous diathesis, as it frequently does, it is often of longer duration than in other circumstances, or when it appears epidemically; and it more readily passes into suppuration of a chronic kind, the matter being discharged externally, and but rarely by the external meatus auditorius. In the *epidemic* disease, perspiration usually breaks out on the fourth or fifth day, commencing and becoming more copious about the neck, breast, and head, but often extending more generally. The pain, tension, and swelling of the parotids afterwards diminish, and the affected parts return to their natural state.

9. *c. Suppuration*, which is more frequent in the *simple*, in the *consecutive*, and in the *scrofulous* states of the disease than in the epidemic, is commonly indicated by a greater intensity of the local symptoms; by marked redness of the more swollen part; by a more central and circumscribed elevation: by the pain being less acute and more throbbing; by the more elevated part of the tumour becoming softer, and ultimately betraying more or less evident fluctuation. The cellular tissue surrounding the gland or connecting its lobules is generally the seat of suppuration. BICHÂT and others have supposed that the lymphatic glands surrounding the parotids are more affected than the parotids themselves; and this may be the case, especially in the *consecutive* (§ 11.) and *scrofulous* varieties of the disease. Probably, also, in the *epidemic form*, these parts, with the glands themselves, and the adjoining cellular tissue, are more or less implicated.

10. *d. Metastasis* of disease from the parotids to the testes, mammæ, or even to the brain or its membranes, has been often observed and noticed by writers as one of the terminations of the disease, especially when appearing epidemically. When this occurrence takes place, the swelling under the ears rapidly subsides, and either the testis or the mamma on the same side with the affected parotid becomes painful and swollen. When both parotids have been affected, the metastasis has in rare instances taken place to both testes or to both mammæ. I have not met with a case in which suppuration has occurred in these parts after metastasis from the parotids. In some instances the parotids have become again affected upon the subsidence of the engorgement of the testicle. I have observed but few instances in which the brain or its membranes have been affected consecutively upon the sudden disappearance of the disease of the parotids; and these recovered under the treatment about to be noticed.

11. *C. The nature* of inflammations of the parotids, in their several modes of manifestation, requires more consideration than has hitherto been devoted to it. That the *epidemic state* of the disease is different in many respects from the primary and simple form is shown by various circumstances, to which I will more particularly allude.—*a. Simple parotitis*, whether occurring *primarily* from cold or any other cause, or *consecutively* of eruptive fevers, or of other affections implicating the throat or mouth, is more distinctly an inflammatory disease, and is more strictly local than the *epidemic* malady. It is also more prone to assume all the characters of inflammation of glandular parts, and to pass into suppuration than the latter form.

12. *b. Epidemic parotitis* is less strictly inflammatory, at least in a large proportion of cases, and is more manifestly congestive; consisting rather in active congestion, or an engorgement of the parotids and adjoining glands, than the simple form of the disease. It is also less a local than a constitutional malady; and this, as well as its more congestive character, is shown by its originating in infection, by its disposition to metastasis, by its definite course, and by its frequently terminating by a distinct crisis. The *simple* or sporadic complaint is attended by fever, which is merely symptomatic of the local inflammatory action; whilst the *epidemic* is characterised by fever, which is less a symptomatic than a primary or idiopathic malady, and of which the swelling of the salivary glands is an attendant or local feature, consisting of congestion or engorgement of these glands rather than of actual inflammation. In the epidemic or specific form of the disease, the fever is rarely sthenically inflammatory, but generally is either mild, or partakes more of an adynamic or asthenic character, and requires a different treatment from the truly inflammatory or simple form of the complaint.

13. *c.* From this it will be seen that I consider

Parotitis, or inflammation of the parotid, to consist of the following *varieties* and *states*:—*namely*, 1st, *Simple* or *Common Inflammation*,—occurring *a. primarily*, or independently of pre-existing disease; and *b. consecutively*, or following eruptive fevers and affections of the mouth and throat, in both which states it usually presents an acute character; 2d, *Scrofulous Inflammation* of the parotids, or parotitis affecting the strumous diathesis, and usually assuming a chronic or indolent form; 3d, *Epidemic Parotitis*, or that proceeding from a *specific* cause, and presenting a *specific* or distinct and regular course. Indeed, it is doubtful whether this last should be arranged as a local inflammation, or rather as a specific form of fever caused by infection, and characterised by congestion or engorgement of the salivary glands, and a tendency to metastasis to the testicles and thence to the brain.

14. ii. TREATMENT.— The treatment of inflammations of the parotid should vary with the severity of the local symptoms, and with the character of the attendant fever.—*a.* In the *simple form* of the disease, when *primary* and *slight*, moderate warmth, sustained by the application of flannel locally, and cooling aperients and diaphoretics, are generally sufficient to promote resolution. I do not believe that cold applications are beneficial in this complaint; they may even prove injurious. In more severe cases, where inflammatory action is unequivocally manifested in the gland and its vicinity, blood should be taken away locally; and a more strict antiphlogistic treatment and regimen adopted as in other cases of inflammation. If suppuration commence, it should be promoted by the usual warm applications, and an early outlet be given to the matter which is formed.

15. *b.* In the *consecutive form* of *parotitis*, particularly that following the anginous states of eruptive fevers, even local depletion should be cautiously prescribed, and with strict reference to its effects. Diaphoretics, stomachic aperients, warm baths, and diuretics are generally required in these circumstances; and if the swelling become sub-acute or indolent, small doses of the iodide of potassium with liquor potassæ may be given in the compound decoction of sarsaparilla. If suppuration take place, the matter should be early evacuated, and the iodide and solution of potash may be given in the decoction of cinchona, &c., and change of air, especially to the sea-side, advised.

16. *c.* The *scrofulous*, sub-acute, and chronic states of parotitis, sometimes require the application of a few leeches to the parts or to their vicinity, and the means just recommended (§ 15.), firmly persisted in for a considerable period. Brandish's alkaline solution may be substituted, in many cases, for the solution of potash. When there is some degree of anæmia, or when the affection occurs in females about the period of puberty, with delayed or scanty menstruation, the iodide of iron may be taken in the syrup of sarsaparilla, and warm salt-water bathing, or warm salt-water hip-baths resorted to.

17. *d.* The *epidemic form* of the complaint is so slight in some cases as to require merely protection from cold and humidity, and attention to the state of the secretions and excretions. The affected parts ought to be kept moderately warm, and the excretions from the bowels and skin promoted. When the local affection is more decidedly inflammatory, the swelling of the neck being considerable, and the surface generally red, febrile action being also great, a number of leeches may be applied, and their operation promoted by warm fomentations. Cold applications are especially hazardous in this form of the complaint, as favouring metastasis to the testes; and this risk may even be incurred by active purgatives. Antimonial diaphoretics and gentle aperients are the safest means which can be employed in most cases of this affection. If metastasis to the testicles or to the mammæ occur, these are also the best remedies, in connection with the horizontal posture. In these secondary states of disease, the application of leeches, followed by warm fomentations and poultices, is generally necessary. Antimonial emetics are often of service in inflammation of the testes; but when this disease occurs suddenly upon the disappearance of parotitis, the subsequent metastasis of the malady to the brain should be dreaded, as it sometimes takes place; and it may be favoured by the active operation and consequent perturbation of emetics, and by the application of cold to the diseased testicles.

18. It is possible that parotitis, caused by cold and humidity, may assume an endemic form, or may affect a number of persons who are exposed to these causes, or exist in a particular locality. It has thus affected a considerable number of a ship's crew; and it has then manifestly arisen from the once general practice of daily, and even more frequently, washing the decks, now happily abandoned. The cold and humidity produced in a confined space by this practice were the sources of more maladies, especially of rheumatism, erysipelas, fevers, &c., than were recognised in those days. Mr. NOBLE, in his account of parotitis endemic in a ship of war, states, that the swelling and redness of the neck suddenly subsided on the fourth and fifth days, and were, in all the cases, rapidly followed by metastasis to the testes, the epididymis and spermatic chord not being affected. In two instances a second metastasis took place from the testes to the brain, the cerebral symptoms being well marked and severe. In no instance did the disease return to the parotids. This remarkable frequency of metastasis was probably favoured by the persistence of the cause originating the disease, and by the use of cold applications and drastic purgatives.

19. *e.* In some instances, especially in aged persons, or in females about or soon after the change of life, the complaint assumes *a chronic state*, obscure inflammation extending to the adjoining cellular tissue, and giving rise to the formation of matter and even to indolent ulceration, if a suitable treatment be not employed. In these, a few leeches should be applied and sometimes repeated, and an antimonial emetic exhibited. Subsequently, antimonial diaphoretics may be given; and if matter form, fomentations, poultices, and an early outlet to the matter are requisite. If the disease become indolent, or if swelling and hardness remain, the iodide of potassium with liquor potassæ and sarsaparilla, should be prescribed. The external application of a weak tincture of iodine, or of the iodide of potassium, in the form of ointment, may also be tried; but I have seldom seen this ointment beneficial unless

the proportion of iodide has been much smaller than that usually prescribed. Dr. Neumann (*Edin. Med.* and *Surg. Journ.* No. 93. p. 452.), applied a plaster, consisting of eight parts of mercurial ointment and one of the iodide of potassium, to the swollen gland with great success, during an epidemic parotitis which prevailed in Silesia, having premised an emetic. When parotitis, either simple or epidemic, occurs about the period of puberty, and previous to menstruation, it is apt to become obstinate and chronic, particularly in scrofulous habits. In these cases, the iodides combined according to the peculiarities of the case; local depletion, emmenagogues, horse exercise, warm salt-water bathing, stomachic aperients, &c., are most serviceable.

III. Organic Lesions of the Parotids.

Classif.—IV. Class, I. Order (*Author*).

20. Structural lesions of these glands, both the consequences of inflammation, and independent of this state of disease, are sometimes observed. The most frequent and important of these are enlargements, scrofulous disease, scirrhus, and open carcinoma. To these may be added the congestions and asthenic inflammation, sometimes terminating in sphacelation, occasionally observed in malignant fevers, and frequently in the plague.

21. *A. Chronic enlargement* of the parotid, without pain, heat, or any other indication of inflammatory action, is sometimes met with. In some cases the gland increases to three or four times its natural size. It is difficult to determine how far hypertrophy is owing to change in the lobular structure, or minuter granules composing the gland, or to deposits of lymph in, or change in the nutrition of, the interlobular and surrounding cellular tissue. Most probably both orders of structure, and even the surrounding lymphatic glands, are more or less implicated; and this seems the more likely, since the researches of Murat and others have shown the granules and minute lobules of the gland to be affected in parotitis. A very remarkable case of chronic enlargement, first, of one parotid and afterwards of the other, the first having become much reduced, after a considerable time, lately came under my care. The history of this case, as well as of others which I have seen, led me to infer that the enlargement was consequent upon obstruction or obliteration of the canal of the duct. After having had recourse to a variety of means, the enlargement was at last entirely removed by a prolonged course of the iodide of potassium in minute doses, with conium. In this instance, from half a grain to a grain only of the iodide was given in the twenty-four hours, a larger dose occasioning uneasiness and febrile excitement.

22. The symptomatic enlargements, congestions, asthenic inflammations, softenings, and even gangrene sometimes observed in malignant fevers and the plague, were imputed by Bichât and others rather to alterations in the connecting and surrounding cellular tissue and lymphatic glands, than to change in the granules of the gland itself. But the researches of Murat and others have shown that these granules are affected from the commencement of simple parotitis; whilst those of Bulard and Clot-Bey have evinced that the surrounding lymphatic glands are more especially implicated in the plague, and in other sympathetic enlargements in the region of the parotids.

23. *B.* Tumours of various kinds are sometimes seated in the parotid; and scirrhus and open cancer, commencing either superficially or in the gland itself, or in the lymphatic glands surrounding the parotids, are occasionally met with. These have been the themes of prolonged surgical disquisitions, as well as the subjects of surgical operation. But in this last resource, the dexterity or daring of the operator have been oftener displayed than the propriety and success of the undertaking. Comparatively few cases admit of this procedure—in very few ought it to be attempted when the disease is malignant; and in none, of a non-malignant nature, without having previously duly tried the means already indicated both in this article and in those on Scrofula and Tumours. (See arts. Saliva, Salivary Ducts, and Salivation.)

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PELLAGRA.—Synon.—*Dermatagria*, Titius; *Scorbutus Alpinus*, Frank; *Ichthyosis Pellagra*, Alibert; *Tuber Pellagra*, Parr; *Lepra Lombardica*, Swediaur; *Elephantiasis Italica*, Good; *Pellagre*, Fr.; *Pellarella*, *Pelagra*, *Mal di Miseria*, *Malattia della Miseria*, *Mal del Sole*, *Mal Roso*, Ital.

Classif.—3*d Class*, 4*th Order* (*Good*).

IV. Class, IV. Order (*Author*).

1. Defin.—*A squamous eruption, chiefly on those parts of the body exposed to the sun or air, preceded and attended by disorder of the digestive organs and nervous system; accompanied with general cachexia; a sense of burning pains in the trunk and limbs; ennui and melancholy; intermitting at first, afterwards more continued; endemic and hereditary.*

2. The *antiquity* of Pellagra has been a subject of doubt. Moscati and others consider that the disease has not been known much before the middle of the last century, whilst Strambio, who was physician and director of the hospital established near Milan for the reception of *pellagrosi*, states, in his treatises published in 1784—7, that he had seen many *pellagrosi* in the hospital, who assured him that their fathers and grandfathers had died of the malady. Dr. Holland adds, that F. Frapoli, physician to the hospital at Milan, in his Treatise on the disease, published in 1771, also contends for its antiquity, and supposes it to be the same disorder as the one called *Pellarella*, which is casually noticed in the records of the Milan Hospital for the year 1578. It is certain, however, from the concurrent testimony of all

writers on the malady, that pellagra has been rapidly increasing itself since the middle of the last century. Dr. Holland, who has investigated the disease more closely than any English writer, remarks that, at the time when Strambio wrote (in 1784), the pellagrosi formed about one-twentieth part of the population in the districts principally suffering under the disorder, namely, in the Alto-Milanese, where the country rises towards the Alps. In these districts, Dr. Holland believes, at the time when he wrote (1817), the pellagrosi to be one in every five or six of the population. He adds that the disease prevails in some districts much more than in others; that it appeared first in the higher parts of the Milanese territory; and that its ravages there are still greater than in any other part of Lombardy. Some time elapsed before it was said to have appeared in the Venetian provinces and near the shores of the Adriatic Sea. At the present time it is increasing in every part of Lombardy, as well on the plains as among the hills which rise on their northern border towards the Alps. It also exists in the province of Friuli, the district intervening between the foot of the Carinthian Alps and the northern shore of the Adriatic.

3. I. Symptoms. — Pellagra is almost exclusively confined to the lower orders, and chiefly to peasants, and those engaged in agricultural employments.—*a.* Its first distinct appearance is that of a local cutaneous eruption, generally preceded by languor, debility, and indications of constitutional disturbance and cachexia. The local symptoms usually first appear early in spring, when the mid-day heat is increasing, and when the peasants are most actively engaged in the fields. The patient first perceives on the backs of his hands, on his feet, and more rarely on other parts of the body exposed to the sun, certain red spots or blotches, which gradually extend themselves, with a slight elevation of the cuticle, and a shining surface, not unlike that of lepra. The colour of the eruption is a more obscure and dusky red than that of erysipelas: it is attended by no other uneasy sensation than a slight pricking or itching, and some tension in the part. After a short time, small tubercles are frequently observed in the inflamed surface. The skin always becomes dry and scaly, forming rough patches, which are excoriated and divided by furrows and rhagades. Desquamation takes place gradually, and leaves behind a shining unhealthy state of the affected surface. Towards the close of the summer, or occasionally earlier, the parts have nearly resumed their natural appearances; and but that the further progress of the malady is familiar to all, the patient might suppose that the mischief had disappeared.

4. With this local affection are connected from the first, general debility, vague and irregular pains of the trunk and limbs, especially in the course of the dorsal muscles and spine; vertigo and headach; irregular appetite and depression of spirits. The bowels are usually relaxed, and continue so throughout the disease. There are no febrile symptoms, and the catamenia of females are generally continued without irregularity, but there are frequent exceptions; febrile symptoms occasionally appearing; and menstruation being more or less obstructed from the commencement; but these occur chiefly in the more advanced course of the malady.

5. The patient obtains a remission, more particularly of the external eruption, during the autumn and winter of the first year; but he almost always experiences a recurrence of the symptoms in the following spring under a more severe form, and with much greater disorder of the constitution. The cutaneous affection spreads, yet still affecting chiefly the hands, neck, feet and legs, and other exposed parts. The skin becomes callous and deeply furrowed; large rhagades appearing, especially near the articulations of the fingers. The cutaneous affection now resembles an inveterate degree of psoriasis, or of lepra vulgaris, and, in some respects, ichthyosis, with which Alibert has classed it.

6. The debility is greatly increased in the second year; often rendering the patient incapable of pursuing his active labours, and rendering him susceptible of all changes of temperature. Partial sweats break out, especially on any exertion. Cramps, spasmodic affections, and pains are frequently complained of; and the mind is despondent and depressed. All the symptoms are aggravated as the heat of summer advances; especially in those most exposed to the sun. They begin again to decline, as in the preceding year, towards the middle or end of autumn; but the remission, as well of the local affection as of the general disorder, is much less complete than before; and the patient continues to suffer during the winter from debility and other constitutional symptoms.

7. The disease may continue for several years thus to remit during winter, and to present increasing or varying grades of exacerbation during the spring and summer, but generally in the third year, or in the fourth or fifth, in some instances, or even later, every symptom is renewed at an earlier period of the spring, and in an aggravated degree. The debility now becomes extreme; the patient is hardly able to support himself; and he is affected with pains in his limbs. All the constitutional phenomena indicate universal cachexia and lesion of the nervous and voluntary powers; the general symptoms now have a close analogy to those of scorbutus. The diarrhœa continues, and augments the debility; and ultimately it assumes much of a dysenteric character, particularly in the latter stages of the malady. The evacuations are offensive and morbid, and preceded by abdominal pains. Aphthæ, thirst, pains at the stomach, &c., are also frequently complained of. The odour of the breath and of the perspiration is extremely offensive. The appetite and digestion are irregular; but they are often less affected than most of the other functions. Dropsical effusions frequently appear at this stage—generally in the form of anasarca, occasionally of ascites. Vertigo, tinnitus aurium, double vision, are now usually present; and all the senses are much impaired. Spasmodic affections, irregular convulsions, involuntary movements of the head and body forwards, and even complete epileptic attacks, often occur.

8. *b.* The *nervous system* presents remarkable disturbance; and the manifestations of the mind are more or less disordered. The pellagrosi complain of a sense of heat in the head and spinal chord; of tingling or darting pains in the course of the nerves; of heat in the limbs, palms of the hands, and particularly in the soles of the feet;

of great weakness of the limbs, with trembling when attempting to stand; and sometimes of contractions of the lower limbs. Their looks become sombre and melancholy. Ennui, depression of spirits, and mental imbecility increase with the progress of the malady. Dr. Holland states, that pellagrosi afford a melancholy spectacle of physical and moral suffering at this period. They seem under the influence of an invincible despondency; they seek to be alone; scarcely answer questions put to them; and often shed tears without obvious cause. Their faculties and senses are impaired: and the disease, when it does not carry them off from exhaustion of the vital powers, generally leaves them incurable idiots, or produces attacks of mania, soon passing into utter imbecility or idiotcy. The public hospitals of Lombardy are incapable of receiving vast numbers of the pellagrosi; the greater proportion perishing in their own habitations, or lingering there wretched subjects of fatuity and decay. Where extreme debility and cachexia are the causes of death, as usually the case, they are attended with colliquative diarrhœa, spasmodic affections, coma, and extreme emaciation.

9. *c. Mania* and *delirium*, consequent upon pellagra, are either *acute* or *chronic*. The acute state sometimes proves fatal in a few days; but the more chronic form seems to retard in some degree the progress of the malady; the strength of the patient declining less rapidly. In this state there is always loss of memory and of the powers of attention. Religious melancholy frequently characterises this form of delirium, with a desire to commit suicide, and usually by drowning. Hence Strambio denominated this morbid disposition by the name of *hydromania*.

10. *d.* Although the disease has been described above as proceeding its course in three or four years, yet it is generally of longer duration. Several intermissions, or remissions, usually occur in its progress. It occasionally remains stationary; and certain of its phenomena sometimes predominate over the others at one time, and others at another time. Thus some relief of his sufferings is experienced by the patient from time to time, although he can entertain little hope of ultimate recovery. Occasionally the cutaneous eruption forms the principal indication of the complaint for several years; it being renewed every spring and disappearing in the autumn. The constitutional symptoms may also continue for some years comparatively slight; and, if the patient be removed to a different locality and to another mode of life, the disease may be further protracted, or altogether arrested in its progress. It is rarely, however, that these means can be adopted; and the constitutional malady is generally so firmly established in the third or fourth year, that few hopes of benefiting the patient by treatment or by change of climate and occupation can be entertained.

11. *e.* Some cases of the disease assume a more *acute* and more rapid form, particularly in respect of the constitutional symptoms. In these the disease proceeds as rapidly as above described, with all the more severe symptoms: and, although the pulse is often very slow and weak, especially in the more chronic cases, it is sometimes frequent and hard in the more acute. This, however, only occurs when fever takes place in the progress of the malady. This consecutive fever is connected either with a state of gastro-intestinal irritation, or of asthenic inflammation, or with predominant affection of the brain and spinal chord; and is generally attended, at first, by heat of skin and irregular remissions, followed by offensive perspiration. These states of febrile excitement generally hasten the fatal termination of the malady, usually with all the concomitant symptoms of the last stage of adynamic fever.

12. *f.* In *infants* and *children* the symptoms of the malady are not materially different from those characterising it in more advanced life. The cutaneous affection of the hands, arms, feet, and legs, is the first to appear; is renewed and augmented in successive years, and attended by the various symptoms indicative of a cachectic state of the body. The malady, as in other cases, has in them a fatal termination, unless a change of climate be obtained in an early period of its progress.

13. *g.* Some *anomalies* have been observed in the progress and succession of the symptoms of pellagra. During its first appearance in Italy, the disease was remarkable for the intensity of the cramps and spinal pains, and the trifling extent of the cutaneous affection. At a more recent period this affection became a prominent feature, whilst disorder of the digestive organs and mania appeared chiefly as secondary symptoms. Different phenomena have also sometimes predominated; in certain years ptyalism, and in others it has been displaced by aphthæ, desquamation of the lips, &c. Very recently the various cramps, spinal pains, and convulsions, insisted on by former writers, have been less noticed than previously, while pellagrous mania and delirium are very common, and gastro-intestinal affections are general.

14. *h.* Pellagra may be *complicated* with other diseases of the skin, such as lepra, psoriasis, erysipelas, eczema, purpura, syphilitic eruptions, &c.; and with intermittent and remittent fever, scrofulous affections, phthisis, peritonitis, white swellings of the joints, &c.

15. II. Appearances on Dissection.—Lesions are found chiefly in the digestive canal, nervous system, and skin. — *a.* In the five bodies examined by M. Brierre de Boismont, the mucous membrane of the *stomach* was red, intersected by bluish or dark vessels, soft, pultacious, and easily removed. The redness was greatest at the large end of the stomach; the mucous membrane was thinner in some cases, and thicker than natural in others. The valves of the duodenum, and the mucous membrane of the small and large *intestines*, were of a lighter or deeper tint, in some approaching to brown. This membrane was generally softened and hypertrophied; it was likewise studded with irregular or round ulcers, surrounded by a reddened base. The subjacent cellular tissue and muscular coat were hypertrophied. The intestines, in all the cases, contained lumbrici. Dr. Carswell, in addition to the usual signs of chronic inflammation of the stomach and intestines, found perforations of the stomach from softening in two cases.

16. *b.* The membranes of the *brain*, particularly the arachnoid and pia mater, in these cases, as well as in those examined by Strambio, Fantonetti, and others, were injected, thickened, and opalescent. The pia mater adhered to the cerebral convolutions, which were slightly atro-

phied. The substance of the brain was in some cases diminished, in others increased, in consistence; the grey substance was injected and deeply coloured; the white substance dotted with vascular points. The cerebellum was slightly injected and somewhat softer than natural. The arachnoid and pia mater of the *spinal chord* were also injected. The grey substance of the chord was somewhat indurated and injected. The white substance was much softened.

17. *c.* The *skin* of the backs of the hands and feet was like leather; and, when examined with a lens, presented a number of irregular cracks, crossing at acute angles, and placed closely, and sometimes implicating the whole thickness of the corion. Small, thin, yellow crusts, and furfuraceous lamellæ of a dirty white, interposed in some of these small fissures, and adhered firmly. The epidermis was six or eight times thicker than natural, brownish, friable, and dry, and was firmly attached. The sub-epidermic layers were much thickened. The radial nerves were softened, reddish, and infiltrated with serum. The most frequent lesions to the above were the usual signs of recent or of old, general or partial *peritonitis*. Indications of *bronchitis* and *pulmonary tubercles* were also often observed. Enlargements of the *spleen* and of the *liver*, in some cases also of the mesenteric glands, and effusion of serum in the shut cavities, have been occasionally noticed.

18. III. ASTURIAN PELLAGRA — *La Rosa* — *Mal de la Rosa* — *Asturian Leprosy*, Thierry, Sauvages, &c. — *Elephantiasis Asturiensis*, Good, — is, according to the descriptions of THIERRY and others, merely a variety of pellagra, and, in its local and general characters, still more nearly approaches the *leprosy of the middle ages* than the pellagra of Lombardy. THIERRY states that this disease generally appears at the spring equinox, on different parts of the body, with redness and harshness of the skin. It afterwards degenerates into rough, dry, blackish crusts, intersected by deep cracks and fissures. These dry and fall off in summer, leaving reddish, smooth, and shining marks, devoid of hair and depressed below the level of the surrounding skin, resembling the cicatrices of burns. They remain through life. In the spring of every year they are covered anew with crusts, which become more and more painful, offensive, and disgusting to the sight. They often appear on the fore or most exposed part of the neck, extending to the clavicles and top of the sternum.

19. To these eruptions are added a constant shaking or trembling of the head and upper parts of the body, heat of the mouth, vesicles on the lips, foulness of the tongue, extreme weakness of the whole body, with a feeling of heaviness, and disorder of the digestive organs. Through the night burning heat, insomnia, groaning without obvious reason, dejection of spirits, melancholy, &c., are complained of. Several suffer slight delirium or hebetude of the senses, particularly of touch and smell. To these are sometimes added slight mania, erysipelas, ulcers, and irregular fever. This malady is often attended in its advanced stages with a tranquil state of mania or melancholia. The patient sinks into a state of dejection, in which he forsakes his home, seeks solitude, and is reduced to utter despair. This mental depression usually appears about the summer solstice, and proves fatal sooner or later. A fatal issue is often also preceded by marasmus and dropsical effusion. The local and constitutional symptoms place this malady in a position intermediate between the pellagra of Lombardy and the leprosy of the middle ages, although more closely to the former than to the latter.

20. IV. DIAGNOSIS. — Pellagra is manifestly allied, in many of its features, to the leprosy of the middle ages on the one hand, and to scurvy, with which however pellagra is sometimes complicated, on the other hand. But still there is an alliance only in certain points. The resemblance also which it bears to *erysipelas*, led TITIUS to define it as a chronic, periodic, and nervous form of that disease; from which, however, it differs widely in its whole history — in local and constitutional symptoms; in its nervous characters and terminations.

21. M. RAYER observes that certain epidemics which have occurred in the north of Europe during the last three or four centuries, and which have been generally attributed to want and to the use of unripe, spurred, and damaged grain, closely resemble pellagra. The resemblance is certainly close in many features, but the difference is great in others. There can be no doubt that local, external, and constitutional diseases, peculiar in kind or anomalous in character, yet varying in numerous modes, grades, and phases, appear in certain localities and at certain epochs, as the several circumstances and agents occasioning them are differently combined, in respect both of the number, grade, and quality of these agents; for it is only reasonable to infer that as causes, agents, and influences are variously associated in number, intensity, and quantity, so will the effects be different, and hence present indescribable forms, varieties, states, and phases, which admit not of distinct or specific limitations as to character, nor of consistent, constant, and uniform manifestations.

22. *a.* It will appear in the sequel (see *Causes*) that many of the circumstances, in which the Italian and Asturian pellagra originate, are the same which gave rise to the leprosy of the middle ages, and to certain epidemics which have appeared in several countries during the fifteenth and sixteenth centuries. Still the features of each vary, or even differ. In the true *leprosy*, the face, roots of the hair, palate bones, nose, are more affected, and the cutaneous disease is more decidedly tubercular; the affection of the skin, of the extremities and face increasing with the other symptoms, and the mind being less disordered, than in pellagra. In the *Italian pellagra* the mental, nervous, and intestinal affections predominate with the progress of the malady.

23. *b.* In the *Asturian malady* the affection of the skin is greater than that of the Italian, and approaches more nearly the severity of leprosy; the affection of the mind is less acute than that of true pellagra, but the *termination* of all these are nearly equally unfavourable, although their *duration* is very variable, not only in regard of the respective maladies, but as respects individual cases of each.

24. *c.* The history of pellagra sufficiently distinguishes it from other diseases of the skin. Chronic *erythema* is never attended by the serious nervous, mental, and digestive disorders characterising pel-

lagra; and *lepra* and *psoriasis* are removed to an equally great distance from the Italian malady, even without taking into account the different characters and forms of the eruption in each, and the ultimately fatal issue of pellagra.

25. *d.* M. Rayer attempts to establish a similarity between pellagra and the epidemic of Paris and its vicinity in 1828, to which the name *acrodynia* has been given. But, although the season of the appearance of the latter was the same as of the former, and although the eruption on the extremities, the pains in the feet and difficulty of walking, the disorders of the digestive organs, closely resembled the same phenomena at an early period of pellagra, yet the absence of the mental disorder, the non-recurrence of the malady, and the general recovery of the attacked, indicate a total difference between the two maladies; the points of resemblance being probably the results of a concurrence of certain causes contributing to the production of pellagra.

26. V. Prognosis.—The circumstances which render the prognosis of pellagra particularly unfavourable, are the unequivocal operation of those causes, to which this malady is attributed; the circumstance of one or other parent of the patient having died of it; an advanced period of its course; the poverty and agricultural occupation of the affected; previous disease, and the severity of the constitutional symptoms, particularly of the disorder of the digestive organs; general cachexia, emaciation, and mental disturbance; severity of the nervous symptoms, and especially the occurrence of mania, delirium, partial or general paralysis; and, at an early stage, the impossibility of removing the subjects of the malady to a different climate, or to other occupations. Pregnancy and lactation also exert an unfavourable influence on its course and termination.

27. VI. Causes.—The hereditary tendency of pellagra is fully admitted by all writers who have observed the progress, or traced the origin, of the malady. There can be no doubt of the disease being continued in succession through families, even the children of pellagrosi becoming affected, when much exposed to the sun and air, or early occupied in the fields. Writers have differed as to the respective liability of sex; but there seems to be no difference in this respect, beyond what may be imputed to occupation and exposure. That these latter circumstances are chiefly productive of the disease cannot be disputed, inasmuch as those only who are subjected to them are affected by it. Doubtless, however, other causes co-operate; but *the influences to which persons thus occupied are alone exposed, should be viewed as the chief agencies in developing the malady.* Some writers have supposed the climate to be the chief cause; but if this were the case, other persons beside agricultural labourers would become affected. This disease has also been attributed to the use of maize, but we do not find that maize has any similar effect in other or similar climates, where it is extensively employed as food. It has likewise been imputed to a rice diet, but the same remark applies also to this opinion. The imperfect and sometimes unwholesome nourishment; the want of animal food, and due proportion of condiments and stimuli; the insufficient use of salt and other antiseptic substances; and the general wretchedness, privations, and filth, of the field labourers in this part of Europe, to all which the malady has been attributed, may certainly concur, in some degree, in developing it; but even these conjoined cannot reasonably be inferred to be the real exciting causes of it, inasmuch as these causes are equally influential, and concur in similar grades of activity in other localities, without pellagra being the result.

28. After considering the various causes and their combinations, to which this malady has been imputed, I infer that they may tend to aggravate its severity, or to increase the predisposition to its appearance, but that other peculiar and endemic agencies are chiefly concerned in generating it. What these agencies are have not been demonstrated, nor do they perhaps admit of precise demonstration, but they appear to me to proceed from the soil and water of the locality. The use of water filtrating through certain or peculiar geological formations, or certain alluvial deposits; the labours of the peasants in fields which are saturated with moisture, or which have been inundated during the preceding winter; and the circumstance of those parts of the body which are most exposed, or most commonly immersed in the water and soil or earth which these labourers cultivate, must readily suggest themselves to the minds of those who reflect on the subject, as the obvious exciting causes of the disease. That the influence of the sun is necessary to develope the cutaneous affection, may be admitted, and may be explained by the effects produced by its rays, or by the drying effects of the air upon the surfaces covered by the moisture of the soil in which the peasants are employed. It has been observed, particularly by Strambio, that, although the sun and free exposure to the air tend to develope more completely the cutaneous affection, still the constitutional symptoms appear and proceed their course, even when no such exposure is incurred, and when the eruption is either imperfectly or not at all developed.

29. Viewing, therefore, the nature of the water of the localities in which pellagra occurs, together with the state of the soil, and the water saturating or inundating the soil, as the chief causes of the malady, it may be admitted that the other agencies to which so much influence has been imputed by various writers, may in some degree contribute to develope and to aggravate the disease, especially the use of unwholesome food, as of sour or diseased rye bread, or of unripe maize or rice; dirty and ill-ventilated apartments; hereditary predisposition; the depressing passions; privations, misery, and exhausting indulgencies. M. Spessa attributes considerable influence to the habit of the poorer inhabitants of passing the evenings and even parts of the day during winter, in the dirty and unhealthy cow-houses and stables, by way of escaping from the cold. The effluvium also proceeding from the accumulated exuviæ of the inhabitants and cattle at the commencement of spring, and of warm weather; and when these exuviæ are exposed and spread upon the soil as manure, and to which the field labourers are more particularly exposed, may not be without its influence, and even exceed that insisted upon by M. Spessa. But, seeing that those persons who are alone affected with pellagra, are those only who are much exposed to the agencies to which I have attributed the malady, the in-

fence that these agencies are the principal causes of it becomes inevitable.

30. It may be further added, that similar causes to those which obtain in Lombardy exist also in the *Asturias*, where a similar malady prevails. These are extreme poverty with its attendants, bad and insufficient food; filth; crowded and ill-ventilated apartments; and agricultural pursuits in the deep and swampy valleys of the country.

31. That the malady should first appear, and be aggravated during spring and summer, can be accounted for by the exposure of the subjects of it at this season to its chief exciting causes, and to the influence of labour, conjoined with increased temperature, in exciting the circulation, and in throwing out, by means of the cutaneous excretion, the morbid materials accumulated in the blood, and disordering vascular action in the digestive organs, in the nervous centres, as well as in parts of the cutaneous surface.

32. VII. Treatment.—It is obvious that the chief means of remedying, or even of checking the progress of this malady, are change of the habits and occupations of those who have become subjects of it, change of climate, and removal of the several causes and influences to which it has been imputed, and particularly of those upon which I have above insisted on. The circumstances in which those are placed who become the subjects of pellagra, very generally preclude the adoption of these measures, which, however, can be but of little avail at an advanced stage and confirmed state of the malady. When the nervous and constitutional symptoms are fully developed—when the cutaneous eruption is constant, extensive, and severe, and is attended by a peculiar offensive effluvium, or perspiration—when affections resembling or approaching to those of either chorea, convulsions, tetanus, epilepsy, palsy, mania or melancholia, appear; or when severe diarrhœa, or dysentery, or marasmus, or dropsy, or pulmonary disease occur, then removal or change of occupation, or medical treatment, is very rarely of avail; and even at an early stage, medicines can produce but little benefit, whilst the patient continues to be subjected to the several circumstances and influences originating the malady. In addition to wholesome and nutritious food, alterative, tonic, and antiseptic articles, should be prescribed, aided by warm bathing and diaphoretics. The alkaline carbonates taken in tonic infusions, or in demulcent and bitter decoctions, or with emollient and narcotic substances, are generally of service; but the treatment should vary according to the various prominent affections which complicate the advanced stages of the disease.

33. For the affections of the *digestive canal*, the decoction of Iceland moss; various emollients, with or without opiates or Dover's powder; fomentations and embrocations on the abdomen, and emollient and anodyne injections are requisite.

34. Affections of the *brain* and *nervous system* during the progress of this malady, admit not of a recourse to lowering means. In but few cases can local depletions even be prescribed with advantage; but, whilst tonics, antispasmodics, and alteratives, conjoined with anodynes, as circumstances may suggest, are administered, blisters may be applied to, or issues or setons inserted in, the nape of the neck; or even small bleedings in the more acute cases may be dissected from this situation or behind the ears. In most of the nervous affections appearing in the course of pellagra, the preparations of opium taken with camphor, or ammonia and aromatics, are of essential service, but chiefly as palliatives.

35. For the cachectic habit of body and cutaneous affection, alkalies and alkaline carbonates with sarsaparilla, particularly the compound decoction, in large quantity, or with antimonials; sulphureous warm baths followed by frictions; milk diet; and attention to the several secretions and excretions, using those means which are most serviceable in improving and promoting them, are the measures which promise the greatest amount of benefit, which, however, can rarely be attained without the removal of the causes which occasion the disease. Even in an early stage of the disease, whilst these continue to operate, and at an advanced stage even when these are removed, medical treatment is generally of little or only of temporary avail, at least as far as it has been employed by the Italian physicians.

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PEMPHIGUS.—Synon. Πεμφιξ, πεμφιγος (a small blister or bubble), πυρετος πεμφιγωδες, Hippocrates, Galen; *Pemphigus*, Sauvages; *Febris Bullosa*, Vogel; *Bullæ*, *Bullosa Febris*, Morton; *Hidroa*, Piso; *Pompholyx* (Πομφολυξ), Willan and Bateman; *Typhus vesicularis*, Young; *Emphlysis Pemphigus*,

Good; *Febris vesicularis, Febris Pemphigoides*, Auct.; *Fièvre Bulleuse, F. vésiculaire*, Fr.; *Wassenblasen, Blasenfieber*, Germ.; *Penfigo*, Ital.; *Vesicular fever*.

Classif.—3d *Class*, 3d *Order* (*Good*). 4th *Order* (*Willan*). IV. Class, IV. Order (*Author*).

1. Defin.—*An eruption of transparent or yellowish bullæ of considerable size appearing on circular or oval erythematous patches, nearly corresponding in diameter with their bases; terminating by effusion of the fluid they contain, and by the formation of lamellar incrustations, or by excoriations.*

2. I. Description. — The various appearances assumed by this eruption have led to various divisions and denominations of it, according to the mode of its eruption (*Pemphigus simultaneus, P. successivus*), — to the number of the bullæ (*P. solitarius, P. confluens*), — to the greater or less rapidity of their course (*P. acutus, P. chronicus*) — to the existence or absence of fever (*P. pyreticus, P. apyreticus*,) — and to the age of the patient (*P. congenitus, P. infantilis*). I agree, however, with Rayer, Cazenave, and Wilson, in the propriety of considering this eruption under the two heads of *acute* and *chronic*.

3. i. Acute Pemphigus. — *P. acutus, Febris bulloea, F. Pemphigoides, F. Synocha cum vesiculis*, Auct. — This is a rare disease. The bullæ almost always stand apart, or are distinct. They are rarely confluent, and they usually appear in succession. They may be partial or more or less general, and may occur on any part of the body, but most commonly on the lower extremities; occasionally, however, also on the arms, the trunk, and the face; most rarely on the soles of the feet, hairy scalp, and genitals.

4. *a*. The *constitutional symptoms* vary from a slight degree of languor and listlessness, sometimes of sickness and general uneasiness, followed by quick pulse and mild fever (*Pompholyx benignus* of Willan), to chilliness or rigors followed by a dry and hot skin with pruritus, by pains in the head and limbs, nausea, thirst, anorexia, tenderness at the epigastrium, very rapid pulse, sore throat, and even slight delirium. In some cases, the fever is attended by irritation of the mucous surface of the digestive, respiratory, or genito-urinary organs.

5. *b*. The *eruption* usually appears the second or third day from the commencement of the constitutional disorder, or even later, in the form of small red spots, preceded and attended by pruritus, and a parched and hot sensation. The spots increase to circular or oval erythematous patches, varying in redness from a pale to a vivid or dusky tint. In the course of a few hours a vesicle arises in the middle of each patch, and becomes rapidly distended by a limpid serum, and increases to the size of a hazel-nut, or even of a large walnut. The bullæ, or *blebs*, which thus arise, are usually circular or oval, and slightly flattened at their summits. They generally correspond with the breadth of the patches on which they appear, and thus conceal them; or they are somewhat smaller than the patches, which thus show around them as a narrow zone, more rarely as a complete areola. The bullæ usually break in a day or two, and expose an excoriated surface, secreting for a few days longer a serous fluid, which concretes into a thin, yellowish scab, and becomes gradually browner and dark; but they sometimes do not burst, and in this case the serum contained in the bullæ assumes an amber or yellowish tint, subsequently turbid and opaque, diminishing in quantity by evaporation, shrivelling and drying up, in the course of a few days, into a thin dark scab. The rupture of the bullæ, and the time when it occurs, depend upon the situation of their eruption. In about three weeks the scabs fall off, leaving the skin beneath of a dusky red hue, but sound.

6. Bullæ are occasionally imperfectly developed, and appear in the form of circular or oval patches, slightly red and prominent. On passing the finger over their surface, the cuticle is felt loosened by a slight effusion of serum between it and the dermis. The cuticle is detached after a few days, exposing a red spot covered by a thin and shining epidemic layer.

7. The *duration* of the disease depends upon the mode of eruption: if this takes place at once, it is no longer than just stated, or from seven to fourteen days; but if the bullæ appear successively, it is longer accordingly, or from three to four weeks. Mr. Wilson remarks, that in the progress of the cutaneous eruption, vesicles are not unfrequently observed on the mucous membrane of the mouth.

8. When the disease is *confluent*, two or more of the bullæ unite and form a *bleb* as large as a hen or a goose-egg. In these cases, the constitutional symptoms are more severe, and are sometimes attended by irritation of most of the mucous surfaces.

9. *c*. This disease sometimes affects *children* — *Pemphigus infantilis* — *P. gangrenosus* of some writers — and sometimes assumes a very serious or even fatal appearance. But this severe form occurs chiefly in lying-in hospitals, or in the crowded, dirty, and ill-ventilated dwellings of the poor. In the cases which I have seen in *infants* the bullæ were numerous, more frequently distinct than confluent, and, in a few instances, presenting many of the characters of *rupia escharotica*, but assuming much more acute features, and even terminating fatally in four or five days. When it occurs in lying-in hospitals, it may present a mild form in some cases, and a very acute and dangerous form in others, even in the same ward and at the same time. It then manifestly proceeds from local causes — from the states of the beds and bedclothes, and the air of the wards.

10. *d*. *Solitary Pemphigus* — *P. solitarius* of Willan — is very rare. I have seen only one case of it. The bulla rapidly attains the size of an orange. It is preceded by disagreeable sensations of tingling and smarting. The bulla breaks in about forty-eight hours, and is succeeded by a superficial excoriation, passing into slight ulceration. One or two days after the disappearance of the first bulla another arises in its vicinity, and pursues the same course as the preceding. In this way, two, three, or even more may appear in succession, the disease being prolonged to several days' duration. Willan says that this variety very rarely occurs, and seems only to affect women. The case I saw was in a man, and occurred on the lower extremity. Biett and Cazenave mention a chronic state of this variety.

11. *e*. *Acute Pemphigus* may occur as a *compli-*

cation or sequela of eruptive fevers, or be *associated* with other eruptions, as with herpes, and more rarely with prurigo. Mr. WILSON remarks that the small bullæ of pemphigus bear considerable resemblance to the vesicles of herpes phlyctenodes; and the likeness to herpes is still further increased by the occasional appearance of the smaller bullæ of pemphigus in the form of rings.

12. ii. CHRONIC PEMPHIGUS.—*Pompholyx diuturna*, WILLAN—*Phlyctenoide confluente*, ALIBERT—is met with much more frequently than the acute, and appears much oftener in adults and aged males than in females. It is either limited to a small surface, or spreads more or less over the body. It is painful and tedious in its course, always successive in its appearance, and affects chiefly persons advanced in age and of debilitated constitutions. It often continues for many months or even years, and, in some cases, appears at a particular season for several successive years, for instance in the autumn and winter, and declining in the spring.

13. *a*. The *constitutional symptoms* of chronic pemphigus are slight compared with those of the acute, some degree of sickness and lassitude, with pains in the head, back, or limbs, precede the eruption during several days; and these symptoms generally vary in degree with the severity or extent of the eruption. The cutaneous disease is often associated with considerable gastro-intestinal irritation; and, in aged persons, and in cachectic habits, it is sometimes attended by dysuria or hæmaturia.

14. *b*. The *eruption* appears first in the form of small red spots, attended by slight itching. The epidermis soon becomes elevated in the centre of each patch. The base of the elevation of the cuticle gradually extends; and often in a few hours an irregularly shaped bulla, the size of a filbert or even of a walnut, is thus formed. Sometimes the bullæ attain the size of an egg. At the end of three or four days some of the bullæ burst, discharge their contents, and leave an angry-looking excoriation of the dermis. In others of them, the serum becomes reddish and turbid, decreases, and dries up, forming a dark scab covered by the shrivelled epidermis. As one crop of bullæ is thus changed, another is produced near to the first; and the disorder thus may be seen in all its stages at the same time, and be prolonged, by successive eruptions, almost indefinitely. The bullæ are occasionally confluent, especially when they appear on the face; but this seldom occurs. They sometimes attain the size of the palm of the hand, the epidermis peeling off and exposing an unhealthy-looking excoriated surface, which seems difficult to heal, or which heals in two or three days, new bullæ forming and pursuing the same course as the former. In some severe cases the patient is confined to bed, but there is rarely any fever.

15. *c*. Chronic pemphigus may be *complicated* with *prurigo*—*Pompholyx prurigenosus* of WILLAN—and with various chronic diseases of the viscera; and in such cases may terminate fatally. It sometimes supervenes on chronic inflammation of the digestive organs, and on partial or general dropsy. When complicated with prurigo, it is often a most distressing affection, and in old persons especially, may hasten a fatal termination, particularly if visceral disease be also present, as commonly observed.

16. *d*. The contagious variety of pemphigus mentioned by WILLAN—*P. contagiosus*—is merely the symptomatic occurrence of bullæ in certain epidemic and endemic maladies described by authors. Its endemic occurrence has been observed by me on two occasions amongst infants in a lying-in-hospital, on each occasion nearly all the infants in the institution becoming affected; but this prevalence was attributable to local causes and not to contagion.

17. *e*. The *morbid appearances* found in fatal cases are entirely those constituting the complications, and usually causing the fatal issue of this affection. M. BIETT and CAZENAVE have often met with fatty liver in their examinations of these cases, with effusion of serum into the chest and other shut cavities.

18. II. DIAGNOSIS.—The bullæ which occasionally appear during the progress of *erysipelas* are accidental, and are to be distinguished from those of acute pemphigus by the latter being distinct, the surfaces between them being neither tumid, nor red, nor painful. The isolated form of the bullæ and the laminated crusts which they form generally distinguish pemphigus from other eruptions. The bullæ of *rupia simplex* are exceedingly few, and terminate in ulcerations and in thick prominent scabs. In *ecthyma* the epidermis is sometimes raised by puriform fluid to a certain extent; but the purulent nature of the contained matter, the brownish appearance of the apex of the elevations, and the presence of pustules of ecthyma at an earlier stage, will sufficiently distinguish the eruption. In *herpes* the vesicles are always formed in groups upon a red and inflamed surface; while the bullæ of pemphigus are generally isolated, and free from surrounding inflammation. Even when the bullæ of pemphigus are small and confluent, so as somewhat to resemble *herpes phlyctenodes*, they are always larger than those of herpes, and some of them present their distinctive characters.

19. III. The PROGNOSIS of acute pemphigus when occurring in adults, and without any complication, is always favourable. When met with in infants in the circumstances above noticed (§ 9.), it is often a serious or even dangerous disease. The prognosis of chronic pemphigus should depend upon the constitution of the patient, and upon the existence of visceral disease. When it is extensive or frequently developed, and affects those debilitated by dissipation or poverty, or when it is complicated with visceral disease, an unfavourable opinion of the result should be entertained. Its severity usually corresponds with the cachectic state of the body affected by it. M. RAYER adduces a case in which chronic pemphigus of the legs following attacks of hæmoptysis, appeared to exert a salutary influence. Where there is obvious visceral disease complicated with this eruption, the cure of the latter will aggravate and increase the danger of the former. Mr. WILSON remarks that he has seen several cases which have induced him to "believe that this eruption is an effort of the system to rid itself of some morbid disposition." I may add, that I have hardly seen a case in which there was not reason to infer, what I have elsewhere so much insisted on, a more or less morbid state of the cir-

culating fluids, owing either to impaired elimination and excretion, or to imperfect assimilation.

20. IV. CAUSES. — Acute pemphigus attacks infants, children, and young persons most frequently. It has been said to be congenital and hereditary. It is most prevalent in the summer, and in those exposed to the sun's rays. I have often seen it in sailors who have exerted themselves under a tropical sun without any covering to the upper parts of the body. It is usually referred to teething; to improper or unwholesome food; to gastric and intestinal irritation; to overfeeding; to mental emotions; and to amenorrhœa and dysmenorrhœa. It has sometimes resulted from the constitutional irritation caused by vaccination. The endemic sources to which infants are sometimes exposed have been already noticed (§ 9.). The symptomatic appearance of pemphigus in connection with various fevers, has been occasionally observed.

21. Chronic pemphigus occurs chiefly in aged persons whose systems are debilitated or cachectic; and appears most frequently in autumn and winter. It is usually caused by intemperate habits, by excesses, unwholesome food, by fatigue; anxiety of mind; low, damp situations; living in cellars and ill-ventilated apartments; exposure to cold; and by chronic irritation of the digestive, mucous, and genito-urinary organs. It is more rarely a sequela of the exanthematous fevers. It may follow disease of any of the secreting and excreting viscera, and thus be complicated with it, the morbid elements not being eliminated from the circulation, but irritating and inflaming the cutaneous surface in the particular mode constituting pemphigus; and often affecting also the mucous surfaces.

22. V. TREATMENT.—*A.* In the mild cases of *acute pemphigus*, but little more is requisite than to exhibit diluents, gentle aperients, warm baths, and diaphoretics, thereby to promote the functions of the several emunctories. When the symptoms are more acute, and the patient is plethoric, a few ounces of blood may be taken away, and purgatives with the rest of the antiphlogistic regimen prescribed. In infants and in cases attended by debility or symptomatic of low fever, the infusion or decoction of bark, with muriatic acid, or with the alkaline carbonates, if the urine be very acid, is generally beneficial; and when any complication exists, especial attention should be directed to it.

23. *B. Chronic pemphigus* often withstands the use of very active means. But it is necessary, previously to determining upon the method of cure, to ascertain as nearly as possible the states of the secretions and excretions, and of the several emunctories. The urine should be carefully tested, and the alvine evacuations daily examined. When the biliary and intestinal functions are disordered, means appropriate to such disorder, as blue pill, or hydrarg. cum creta with ipecacuanha, or opium, or with Dover's powder, should be exhibited. In most cases, warm baths — either simple or alkaline — are of essential service. When the liver is torpid, after a recourse to calomel or milder mercurials, the nitric or nitro-hydrochloric acids may be given with the infusion or decoction of cinchona, or the decoctions of sarsaparilla. If the urine be acid, the liquor potassæ with the preparations of sarsa are generally beneficial; and, if the digestive mucous surface be exempt from marked irritation, small doses of the iodide of potassium may be added with great advantage. When there is marked disorder of the digestive organs, warm baths, alteratives, ipecacuanha, and anodynes are generally requisite. When the evacuations are offensive, as well as frequent, care should be taken not to confine the bowels by opiates, but rather to correct the secretions by alteratives, by the alkaline carbonates and salts, and by a spare farinaceous and milk diet. If, however, the intestinal irritation be severe, and the symptoms present a dysenteric character, ipecacuanha or Dover's powder, in frequent doses, may be exhibited, and emollient enemata administered; and, when restlessness and pain are complained of, these means, aided by warm baths, will be still more requisite.

24. When the menstrual discharge is suppressed or interrupted, these measures should be directed to its restoration: but these measures should be chosen according to the peculiarities of the case. In most cases of menstrual obstruction connected with cutaneous eruption, the iodide of potassium with liquor potassæ, and tonic infusions will prove beneficial, if the bowels be duly regulated by means of suitable aperients; and the biborate of soda conjoined with any of the preparations of aloes will often be of use in similar circumstances. M. RAYER has had recourse to the arseniate of soda in obstinate cases of pemphigus; and in these DONOVAN's solution of the iodide of arsenic and mercury may be employed with some hopes of advantage, as I have seen benefit derived from it, in one case of this kind, for which I lately prescribed it.

25. The observation made above respecting the pathological relations of pemphigus (§§ 19. 21.) should be borne in mind during the treatment of this eruption, and especially of the chronic states and complications of it; for a morbid condition of the circulating fluids arising either from insufficient elimination or excretion, or from imperfect assimilation, as fully shown in the articles BLOOD and DISEASE, generally more or less obtains not only in this, but also in most other cutaneous diseases. This position being unassailable, it should form the basis of our therapeutical operations, and all our efforts ought to be directed to the restoration of the excreting functions — to the removal of all obstructions to the discharge of these functions, and especially of the cutaneous functions.

26. *C.* The *topical treatment* of chronic pemphigus is often of much importance. As a general principle, the serum effused in the bullæ should, as soon as they are fully developed, be let out by puncturing them, for even the partial absorption of it tends to perpetuate the morbid condition of the circulating fluids on which the complaint chiefly depends; whilst the early removal of the morbid secretion prevents not only this contingency, but also the excoriations and sores which often result from leaving the bullæ uninterfered with. After puncturing the bullæ, warm baths, warm bread and water poultices, or emollient fomentations may be employed, and, subsequently, gently astringent lotions, or absorbent powders, or healing ointments, may be applied according to the circumstances of the case.

27. *D.* The diet in this, as in many other cutaneous affections, should consist chiefly of milk and farinaceous articles; animal food, of easy digestion, should be taken sparingly; but veal, pork, shell-fish, and dried or highly-seasoned articles, ought to be avoided. In cases requiring tonics, a more generous diet, and good wine in moderate quantity, may be allowed, particularly if due exercise in the open air be also taken.

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PERICARDIUM. See art. HEART AND PERICARDIUM.

PERIOSTEUM. — Περιοστεον — *Périoste*, Fr. — *Die Knochenhaut, Beinhaut*, Germ. — *The diseases of the periosteum* have been noticed in the articles BRAIN — *Membranes of*, CRANIUM, FIBROUS TISSUE, and OSSEOUS SYSTEM. When thus treating, in their respective relations, of certain portions of the periosteum, and when viewing them in connection with the bones which they form and support, the several alterations of structure observed in the periosteum were fully noticed. It now only remains for me to consider *inflammations of the periosteum and their consequences.*

1. INFLAMMATION OF THE PERIOSTEUM. — SYNON. — *Inflammatio periostei, periosteitis, periostitis; Periostite*, Fr.; *Die Entzündung der Beinhaut*, Germ.

CLASSIF. — III. CLASS, I. ORDER (*Author*).

2. DEFIN. — *Pain, more or less acute, referred to the surface of one or more bones, with tenderness on pressure; deep-seated swelling, at first obscure, but afterwards more manifest, sometimes with redness in the parts covering the more superficial and prominent bones; more or less symptomatic fever.*

3. The conventional division of periostitis into *acute* and *chronic* is useful, although every grade of activity and duration obtains in this as well as in other diseases. Periostitis is also *simple* and *primary*, or *consecutive* or *constitutional*. In this latter case it generally proceeds from previous disease, and is characterised by a certain diathesis, or is the consequence of a specific cause. Thus periostitis may be *scrofulous, gouty, scorbutic*, or *rheumatic*, and present certain modifications in its course and consequences, as it occurs in constitutions thus characterised. It may, moreover, be *specific*, or be caused by certain specific causes, as by syphilis and the excessive use of mercury. Due regard to these several states of the disease is requisite in practice, inasmuch as each of them requires a modified treatment.

4. i. SYMPTOMS. — *A. Acute* and *sub-acute periostitis* often commences in an insidious manner; but it sometimes declares itself very acutely. In the former case there are generally neither chills nor rigors, and the accompanying fever may be slight; in the latter case, chills or rigors are often experienced, with intense pain, complete insomnia, and severe symptomatic fever. The progress of the disease in the one is generally slow, in the other much more rapid. It is often difficult to determine whether or not the inflammation is seated in the periosteum or in the bone itself. Most frequently, I believe, the bone is affected nearly as soon as the periosteum, more especially in the scrofulous and syphilitic states of the disease. If the bone be superficial and the inflammation severe, swelling, at first hard or resisting, subsequently more superficially soft or doughy as it increases, may be detected in the course of the bone.

5. *a.* The symptoms are much more obscure where the periosteum of deep-seated bones is affected. In these cases, the attending swelling may be obscure or hardly felt, and the existence of the disease can be only inferred from the pain being fixed in or limited to some part of the skeleton, and from the nature of the predisposing and exciting causes. It is difficult to determine whether the disease commences in the exterior or in the interior surface of the periosteum, unless under particular circumstances, as when the periostitis is caused by certain external injuries, by ulceration, or the extension of inflammation from parts covering the periosteum. In such cases, and when the inflammation extends from the periosteum to the soft parts covering or surrounding it, it may be inferred that the external surface of the periosteum is chiefly affected, and the bone underneath either slightly or not at all. And this condition may be also inferred where the disease attacks the *rheumatic* and *gouty diatheses*; and, in these cases, particularly where the periosteum in the vicinity of joints is implicated, serum or fluid lymph often accumulates in the sheaths of tendons, or even within or around the capsules; similar changes, in these situations, have also been observed by me in several cases of *syphilitic periostitis*, complete recovery taking place without any indication of disease of the bones.

6. *b.* In the more *acute cases* of periostitis, *suppuration* is not an infrequent result. If the external surface of the periosteum be chiefly affected, the swelling becomes more and more manifest, softer, and circumscribed. The tissues external to the primary swelling become somewhat œdematous or even reddened, and fluctuation, at first obscure, may be detected. In scrofulous constitutions, and when the periosteum of the long bones is affected, especially near articulations, œdema of the joints, or serous effusion under the capsules, or in the sheaths of tendons, is often observed;

but these changes may also take place independently of suppuration, as in the rheumatic diathesis, but more frequently in connection with it, in the scrofulous.

7. *c.* In the more acute cases of periostitis, when there is reason to infer the extension of inflammation to the bone itself, *suppuration* may likewise occur, and may detach the periosteum from the bone; but, in the more intense cases, and in cachectic or scorbutic habits, the morbid action in the periosteum may give rise to the effusion of a turbid serum between the periosteum and the bone, detaching the one from the other to a considerable extent, even before suppuration takes place, and to *gangrene* of the periosteum and *necrosis* of the bone. This result may take place in acute periostitis of any of the more superficial bones, and not infrequently in periostitis of the bones of the cranium and face; but suppuration is a more frequent occurrence. (See articles CRANIUM (§ 4.), and OSSEOUS SYSTEM — *Osteitis.*)

8. *B. Chronic periostitis* usually commences slowly and insidiously, and presents similar constitutional and specific relations to those above alluded to (§ 3.). It is more frequently observed than the acute, and is sometimes connected with ulceration, tumours, or other organic changes of the parts external to the periosteum; and is attended by slight pain only, which is often aggravated during the night by more or less tenderness, especially in superficial situations; and by varying or slight symptomatic fever and constitutional symptoms. Chronic inflammation, when limited to a very small extent of the periosteum, may produce various local changes, according to the grade of morbid action, and to the character of the secretion infiltrating the inflamed part and contiguous tissues; it may occasion simple thickening and induration, or even thickening with softening; it may give rise to the accumulation of a glairy, soft, or gelatinous or semifluid matter, chiefly external to the periosteum; or to a greyish homogeneous matter resembling soft cheese; or to a fibrous, cartilaginous, or osseous substance. These even may form apparently between the periosteum and the bone, or in the fibrous structure of the former.

9. In the *rheumatic form* of chronic periostitis, thickening, or fibrous, cartilaginous, or even osseous transformation of parts of the periosteum sometimes takes place, particularly in the vicinity of articulations; occasioning stiffness or even complete immobility of the joint or joints. In the *gouty state* of the disease, a calcareous or chalky deposit, similar to that which forms around the articular ligaments, and consisting chiefly of the urate of soda, sometimes takes place in the structure of the periosteum, or between it and the bone. In addition to these changes, various others are met with in the bones and in the periosteum, consecutively of chronic periostitis; but I must refer the reader to the notice taken of them in the articles mentioned above (§ 7.).

10. The *terminations* and *consequences* of periostitis are in every respect the same as those shown to follow *osteitis*, and are attended by the same symptoms as accompany them. (See OSSEOUS SYSTEM, §§ 12—22.)

11. ii. ASSOCIATIONS OF PERIOSTITIS. — The periosteum is very rarely inflamed without an extension of the morbid action, in a greater or less degree, to the bone itself. Hence it is difficult to determine how far the bone is affected until the disease in it has made considerable progress. Much depends upon the diathesis and age of the patient, and the nature of the exciting causes; but when the pain referred to the bone whose periosteum is affected is increased, as in the case of any of the long bones, by sustaining a weight or standing on it, inflammation of the bone itself may be inferred. The association of osteitis with periostitis is most frequent in young persons, children, and the scrofulous diathesis; and the least so in the gouty and rheumatic.

12. When periostitis is seated in any of the vertebræ, or in the sacrum, or indeed in any of the bones either encasing parts of the nervous masses or furnishing outlets to the nerves, the consequent swelling of the periosteum and effusion of lymph may so affect the parts of the nervous system contiguous to it, or the nerves as they pass through their respective foramina or outlets, as to interrupt their functions, and to occasion *paralysis* more or less complete. I have seen several cases of paraplegia thus produced; and very recently attended one with Dr. JOHNSON and Mr. LISTON where this complication existed. In these cases the bladder is often affected — indeed always when paraplegia is present. Periostitis may be also associated with *neuralgia*, and in this case the former is usually the cause of the latter, which not infrequently, in these circumstances, passes into palsy.

13. When periostitis affects the head, as the *pericranium*, of which I have seen two or three cases, one of them that of a physician in this city, the symptoms are often distressing. The disease may be either acute or chronic, and proceed simply and favourably, as in the case just alluded to; but it also, owing to the extension of the inflammation to the inner table of the skull, or to the effect produced upon the nerves in the vicinity, may be complicated with *epilepsy*, as in a case recorded by Dr. GRAVES. Indeed, epilepsy is not infrequently caused by inflammatory and other changes in the dura mater; and we know that inflammation may be propagated from the pericranium, through the tables of the skull to this membrane, especially after injuries.

14. The complication of periostitis with gout or rheumatism need hardly be mentioned, since the latter are more commonly causes than complications of this malady; and this remark is still more applicable to syphilitic periostitis. Still they should be viewed also as complications requiring a modified and even peculiar mode of treatment.

15. iii. *The changes found in the periosteum* during the several periods of periostitis are briefly these: — In the simple and early state of the disease, the membrane is red and injected, without any remarkable thickening or softening. The adjoining cellular tissue is also injected. At a somewhat more advanced period the injection increases and extends to the bone, the adhesion between which and the periosteum is now somewhat impaired. At a still later stage this membrane is redder, thicker, and somewhat softer, owing to some infiltration of lymph or serum; and it is much more easily detached from the bone; and the bone itself is often more discoloured. In the

more chronic states of the disease, the membrane is less red, but it is more thickened, is more dense, and more closely adherent to the bone. In scrofulous persons, small abscesses or scrofulous suppuration may take place in the periosteum, and extend outwardly, with or without a more or less serious lesion of the bone.

16. When the disease goes on to suppuration, which may occur in either the acute, the subacute, or chronic state, particularly the latter in scrofulous persons, the periosteum is still more thickened, softened, villous at its surface or even fungous. Suppuration most frequently occurs in the outer surface of the membrane, and proceeds externally; but sometimes it takes place from the internal surface, particularly when the bone is much affected. In this latter case it detaches the periosteum from the bone, causing considerable changes in both, often with perforation of the former, with extension of the abscess externally through the soft parts, and with the death of the bone underneath. In cases of injury of the pericranium, purulent matter is not infrequently collected between this part and the bone, and the inflammation having extended through both tables, advances to the dura mater, between which and the inner table matter often also collects, so that, before the abscess breaks externally, fatal lesions may be produced underneath the bone. In some cases, abscess forms externally to the periosteum, and this membrane is thickened, opposing for a time a barrier between the abscess and the bone; but this is at last overcome, and the bone is more or less destroyed. In this case, periostitis and osteitis are consequent upon the inflammation of the adjoining parts. The other changes observed after periostitis are the same as those found after osteitis, and are described in the article on the OSSEOUS SYSTEM (§§ 12—22.).

17. iv. THE DIAGNOSIS of periostitis is generally easy when the periosteum of superficial bones is affected; but, in other circumstances, it is extremely difficult. The history of the case, and the relation which the symptoms have with the causes which seem to have produced them, will generally aid in the formation of a correct opinion. When an acute or aching pain is felt in the situation of a bone, and is increased on firm pressure, and during the night; and more particularly when there is a fixed and deep-seated swelling which is continuous with the surface of the bone, it may safely be inferred that either periostitis or osteitis is present, or both; and, although it may be impossible to determine which of the two structures may be chiefly affected, the circumstance is the less important, inasmuch as the treatment is the same, or very nearly the same, for both. It is often much more important to ascertain the existence of certain of the consequences of the disease, particularly of *suppuration*, or of *caries*, or the death of the bone. When the former occurs, redness is often observed at the surface, unless the periosteum be deep-seated, and there is also some degree of œdema of the adjoining parts, followed by more or less distinct fluctuation, particularly when suppuration commences in the external surface of the periosteum. The existence of *caries* is to be inferred from what has been stated on the subject under the head OSSEOUS SYSTEM (§§ 16—20.).

18. v. THE CAUSES of periostitis are altogether the same as those which produce osteitis. They are *constitutional* or *intrinsic*, or *external* or *extrinsic*. *a.* Many of the former are chiefly *predisposing* causes, as the scrofulous, gouty, and rheumatic diathesis; but syphilis is not only a predisposing, but also an energetic *exciting* cause; and when it affects the scrofulous diathesis, not only periostitis, but osteitis also, often supervenes. Periostitis may also follow fevers, especially exanthematous fevers of a malignant character. It is not infrequently caused by scurvy, and by various chronic cutaneous affections, when neglected, or allowed to proceed to ulceration, particularly in the extremities. All debilitating agents, unwholesome food, exhausting excesses, and the abuse of mercury, also predispose to periostitis.

19. *b.* The *exciting causes* are chiefly contusions and local injuries of all kinds; chronic ulcers near or over superficial bones; the irritation of abscesses, of tumours, or of tubercles in the vicinity of the periosteum; excessive muscular exertion, sprains, &c.; exposure to excessive cold or heat; and a prolonged or unsuitable exhibition of mercury, especially for syphilis affecting the scrofulous diathesis. Many of the cases of periostitis, osteitis, and consequent *caries* of the bones of the skull and face, which were formerly so frequent, and which are still occasionally met with, are more attributable to the excessive use of mercurials than to the disease for which they were prescribed.

20. vi. TREATMENT. — *A.* In the *acute* or *early state* of this malady, the antiphlogistic treatment and regimen are requisite, particularly in young, robust, or plethoric persons. Even when we have cause of suspecting the periosteum only to be affected, the intimate connection between it and the bone should induce us to employ decided and prompt means. *Local depletions* are always requisite, particularly in the simple form of the disease, occurring in a previously healthy person, and they ought to be large or repeated, or be preceded by general blood-letting, especially in robust or plethoric habits. After depletion, *calomel* should be freely exhibited with *antimonials* until the gums be affected, and I agree with Dr. GRAVES in thinking that the calomel is especially required when the pericranium and bones of the head are implicated; taking care, however, not to prescribe calomel so as to risk an injurious effect from it. When the periosteum of the more superficial bones is affected, as those of the head, face, or extremities, the practice of making *incisions* down to the inflamed structure, even before suppuration has commenced, and with the view of preventing this consequence of the inflammation, seems judicious, and is advocated by CRAMPTON, VELPEAU, BERARD, and others. These incisions not only unload the vessels of the inflamed and adjoining tissues, but tend to determine the suppurative process, if this should occur, externally in the direction of the excisions, and thereby to protect the bone. When the inflamed periosteum is, however, deep-seated, such early incisions can hardly be practised, or only may be ventured on when suppuration has advanced. After local depletions, or even when they cannot be prescribed, as in those sub-acute attacks which sometimes occur in debilitated, exhausted, or broken-down constitutions, *blisters*, other *issues*, or

the tartarised antimonial ointment, or other means which will produce vesication or irritation, with a *copious or prolonged discharge* from the cutaneous surface over the inflamed periosteum, will often prove extremely beneficial; but, as soon as vesication or a discharge is obtained, it should be favoured by warm poultices, and such other means as the peculiarities of the case will suggest, and perpetuated for a considerable period, so as to fully determine its effects. After these antiphlogistic means have been employed, the treatment about to be advised for the *chronic states*, if the disease still continues, should be employed.

21. *B.* In the *chronic states* of periostitis, the treatment should be nearly the same as that recommended for osteitis; for in this state the bone generally partakes more or less in the morbid action. Such, however, may not be the case to any extent in the *rheumatic* or *gouty states* of the disease, even when assuming more of an acute than of a chronic character; but, in the *scrofulous form* of the malady, the probable extension of the morbid action to the bones requires more especially the treatment advised for osteitis; namely, recourse to the *iodide of potassium*, with *liquor potassæ*, or Brandish's alkaline solution, in either of the preparations of *sarsaparilla*, or in bitter infusions. In the rheumatic and gouty states these means are equally beneficial; and occasionally the *mistura guaiaci* may be advantageously made the vehicle of the other medicines. In these states also, some one of the preparations of *colchicum* may be added to those just named; and a small quantity of *sulphur* with magnesia may be taken at bed-time for a considerable period, or until convalescence is far advanced.

22. *C.* If *suppuration*, either externally to the periosteum, or between it and the bone, should take place, an early exit ought to be given to the matter; and the local treatment proceeded with according to the circumstances of the case. The *iodide of potassium* and *liquor potassæ*, with *sarsa* and *tonics*, should, however, be persisted in, if no urgent reason exist to contra-indicate them; as they generally enable the system to repair whatever local mischief may have been done. In many of these cases, a full dose of some one of the preparations of *opium* will be conjoined with the above, or given at bed-time with benefit.

23. *D.* In the *other states of organic lesion* occurring in the periosteum, the means now mentioned are generally most efficacious, even when associated with *caries* of the bone. I state this from experience; but I should also add, that I have likewise seen the *bichloride of mercury*, prescribed in the *compound tincture of bark*, with tincture of *capsicum*, almost equally beneficial with the iodide, both in the simple and in the advanced and complicated states of periostitis. In cases of *syphilitic periostitis* this salt, either in simple solution or prescribed with sarsa, is the chief remedy upon which we should confide, particularly if it be taken according to VAN SWIETEN's method, and soon after a meal. In cases where mercury has not previously been given, or in those where it has been given in inadequate quantity or inefficient form, this mode of treating syphilitic periostitis should not be overlooked. Where, however, mercury has been resorted to in this complicated state of the disease, without marked benefit, the *preparations of iodine* should be preferred and sufficiently tried. As far back as 1824 I employed these preparations with decided success in both syphilitic and scrofulous periostitis; and about this period I prescribed them for a gentleman whose case presented this complication, and had become remarkable for the persistence and consequences of this disease, and the number of medical means and measures he had had recourse to. They proved efficacious in his case, as well as in others, and he is now alive and well. (See OSSEOUS SYSTEM, §§ 23—25.)

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PERIPNEUMONIA.—See LUNGS—INFLAMMATION OF.

PERITONEUM—DISEASES OF.—The *peritoneum* (περιτόνεον from περιτείνω, to extend around) was not recognised, until a comparatively recent period of medical history, as being often the seat of disease, independently of the parts which it envelopes; and, as will be shown in the sequel, the most serious changes to which it is liable were, until modern times, often confounded with other maladies. The greater precision imparted to pathological research since the appearance of the writings of MORGAGNI, and more recently of those of C. SMITH, BICHÂT, BARON, and others, and the more accurate connection of lesions of this membrane with the phenomena or symptoms by which they are indicated, furnished by numerous modern writers, more especially by those referred to at the conclusion of this article, have combined to place our knowledge of the nature, symptoms, and treatment of diseases of the peritoneum greatly in advance of the progress it presented at the close of the last century, or even at the commencement of the present. In this article I shall, *first*, consider the several states of *inflammation of the peritoneum, and their consequences*; and, *secondly*, the *structural changes found* in this membrane independently of inflammation.

1. INFLAMMATION OF THE PERITONEUM. — SYNON. — *Peritonitis*, Vogel, Cullen, &c.; — *Phlegmone Peritonei, Phlegmone Mesenterii*, Prosper Alpinus; — *Epiploitis*, Sagar, Sauvages; — *Omentitis*, Vogel; — *Inflammatio Omenti*, Boerhaave; — *Mesenteritis, Enteritis Mesenterica*, Sauvages; — *Inflammatio Mesenterii*, Hoffmann; — *Febris Mesenterica*, Darwin; — *Enteritis epiploitis*, Parr; — *Cauma Peritonitis*, Young; — *Empresma peritonitis*, Good; *Inflammatio Peritonei*; — *Péritonite, Inflammation du péritoine*, Fr.; — *Darmfellentzündung, Bauchfellentzündung*, Germ.

CLASSIF. — 1*st Class*. 2*d Order* (Cullen); 3*d Class*. 2*d Order* (Good); III. CLASS. I. ORDER (Author).

2. DEFIN. — NOSOLOG. DEFIN. — *Tenderness, pain, heat, and tumefaction of the abdomen, with symptomatic fever; the patient always preserving a supine posture, with the knees drawn up; and the pain being aggravated by pressure, or by actions of the abdominal and respiratory muscles.*

3. PATHOLOG. DEFIN. — *Increased vascularity, softening, or thickening of the peritoneal membrane, with effusion of coagulable lymph, or of a sero-albuminous, or sero-puriform, or sero-sanguineous fluid; sometimes with organised adhesions, &c.*

4. Inflammation of the peritoneum may affect persons of any age, of any temperament, and of any habit of body; it may attack suddenly and acutely, or slowly, insidiously, and chronically; it may be general or limited, or at first partial, and afterwards more or less extended; and it may be primary or idiopathic, and consecutive or symptomatic. It may, moreover, be characterised by either of those states of vital diathesis which I endeavoured to establish as important pathological distinctions, when treating of *inflammation*, and which I ascribed to the nature of the exciting causes, and to the states of vital or constitutional power, and of the circulating fluids. Hence *peritonitis* may also be either *sthenic* or *asthenic*, as regards the local action and the accompanying fever.

5. I. ACUTE PERITONITIS. — *Acute peritonitis* in a *sthenic form*, often *commences* in a part only of the peritoneum, but extends more or less to other portions of it. It is comparatively rare, in this state of the malady, that the peritoneal surface is at first extensively affected; but I have seen many cases of the puerperal and erysipelatous states of the disease — of the *asthenic form* — in which this membrane was more or less extensively implicated at an early period, and more particularly in the puerperal states of peritonitis associated with, or even arising from, *contamination of the circulating fluids.*

6. *True* or *primary peritonitis* commences in, and is chiefly confined to, the peritoneum; and, when thus originating, the inflammation more rarely extends to the organs which are enveloped by this membrane. As I have shown on several occasions, the inflammation does not so rapidly spread over the surface of the peritoneum as was generally supposed, unless in the asthenic forms of the disease, although the lymph thrown out from the surface of the part first affected rapidly irritates and inflames the opposite surface, or that coming in contact with it; so that it may be confidently asserted, that sthenic acute peritonitis extends rapidly and chiefly by contiguity of situation, and, but slowly and less remarkably, by continuity of surface. I have often observed the opposite surfaces, or those in more immediate contact, intensely inflamed, whilst large portions of the surface continuously interposed between the inflamed parts were unaffected.

7. This limitation of the inflammation to opposite surfaces is equally remarkable when the *peritonitis is consecutive* of inflammation of a subjacent tissue or organ; unless indeed the circulating fluids have become contaminated and constitutional power much depressed — circumstances tending remarkably and rapidly to spread the morbid action continuously over the surface. In this latter case coagulable lymph is not formed, but a turbid and irritating serum is abundantly thrown out, as will be more fully noticed when I consider certain asthenic and complicated states of the disease.

8. i. SYMPTOMS OF ACUTE STHENIC PERITONITIS. — The symptoms of acute peritonitis vary with the causes which produce it and with the portion of the membrane primarily and chiefly affected. As this form of the disease often originates in, and is limited to, a part only of the peritoneum, although often extending more or less rapidly and generally, I shall first describe the symptoms of the more *partial states* of peritonitis, and next those of *general* peritonitis.

9. *A.* PARTIAL PERITONITIS is most frequently observed after *surgical operations*, in connection with incarcerated or strangulated *hernia*, and consecutively of inflammation of the *appendix cæci*, as shown in the article CÆCUM, and of *metritis*, *ovaritis*, and *cystitis*. It is often also consequent upon, or associated with *splenitis*, *hepatitis*, *enteritis*, and *dysentery*; and upon *chronic ulceration and perforation* of the *stomach* or of an *intestine*. Indeed, partial peritonitis is often consecutive of inflammation of parts enveloped by this membrane, the disease proceeding no further, when occurring in a previously healthy state of the frame, than in the production of coagulable lymph, and the affection and agglutination thereby of the opposite surface, terminating in adhesions which, as will be shown hereafter, time will modify or alter.

10. *a. Partial peritonitis*, consequent upon *local injury*, *surgical operation*, or occurring without any very obvious cause — *Peritonitis partiaria traumatica et spontanea* — generally commences with pain confined to a particular part of the abdomen; often with rigors or chills, but sometimes without either; with tenderness on pressure, and with slight fulness. To these soon succeed the usual attendants of symptomatic fever; increased or more constant pain and tenderness; a somewhat swollen, hard, and hot state of the most painful part; nausea, vomitings, and an anxious expression of the countenance, in the most severe cases. The bowels are confined, but stools are usually procured by active purgatives and enemata. The pulse is frequent, small, hard or constricted. In some instances the complaint proceeds no further, and either gradually subsides or is followed by indications of circumscribed effusion, or more rarely of purulent collection. In other cases the disease extends, and assumes, with greater or less rapidity, all the characters of general peritonitis (§ 19.).

11. *b.* Peritonitis connected with *incarcerated or strangulated hernia* — *P. Hernialis* — *P. ex strangulatione* — presents similar features to the above, being only more intense and rapid in its course. The symptoms of partial peritonitis may exist, in cases of hernia, without any appearance of hernial tumours, and without the bowels being obstructed. In these cases, most probably only a small portion of one side of the bowel is strangulated, the canal not being thereby obstructed. A very interesting case of this kind occurred many years ago in a cook in my family, who had been subject to femoral hernia. She was removed to Guy's hospital, where she remained for a very considerable period under the care of Sir A. COOPER and Mr. CALLOWAY, who agreed with the author in considering the case to be one of partial peritonitis from the strangulation of a

small portion of one side of the sigmoid flexure of the colon. No tumour could be detected in the seat of the hernia. She ultimately recovered without an operation. Partial peritonitis, arising from internal strangulation, or even from the strangulation caused by the adhesions or bridles formed by an old partial peritonitis or omentitis, or from the operation of hernia or other local causes, presents the same symptoms as have been already noticed, and usually pursues a most unfavourable course, the inflammation extending with greater or less rapidity, with obstruction of the bowels and its consequences.

12. *c.* Inflammation not infrequently commences in that portion of the *peritoneum covering the appendix vermiformis and cæcum* — *Peritonitis partiaria cæci* — and is either more or less limited to it, or extended much farther. In most of these cases the disease arises, as I have shown in the article CÆCUM, from inflammation of the appendix caused by the passage into it of hard substances, as the stones of fruit, gall-stones, &c. The symptoms are chiefly acute pain in the cæcal region, with distension, great tenderness, fulness or swelling, tormina, costiveness, nausea, and occasionally vomiting, with symptomatic fever. The inflammation may continue limited to this portion of the peritoneum and the more immediate vicinity, terminating either in suppuration or in gangrene of the appendix, or it may extend much further over the peritoneum, and ultimately become general. Several cases illustrative of these states and terminations of this form of partial peritonitis have come before me, and some of them are fully noticed in the article CÆCUM.

13. *d. Inflammation of the peritoneum reflected over the abdominal muscles* — *Peritonitis superficiaria* — *P. antica* — *P. externa* — was first noticed by J. P. FRANK, and afterwards by HILDENBRAND. They considered that this variety might be distinguished from inflammation of the visceral peritoneum. They remark, that it is attended by extreme tenderness of the abdomen, particularly at the umbilical region; by an extension of the inflammatory action to the cellular tissue connecting this membrane with the muscles; and often by the effusion of lymph into the sheaths of these muscles, causing extreme tension, hardness and swelling. This variety usually commences with rigors, chills, and irregular heats, preceded and attended by a fixed, acute and burning pain, remarkably increased by coughing, and by motions of the trunk. There are marked heat of the abdomen; swelling and hardness, particularly in the course of the recti muscles; occasionally distinct and circumscribed tumours; intolerance of the touch of the bed-clothes, and of the slightest contractions of the abdominal muscles; and symptomatic inflammatory fever, with its usual attendants. The vomiting and obstinate costiveness accompanying some other states of peritonitis are not usually remarkable in this. These symptoms may, however, be present, and be attended by anxiety, nausea, and dyspnœa, as the inflammation becomes more extended, and by singultus, laboured respiration, &c., when it mounts to the diaphragm, as it usually does in the most severe and unfavourable cases.

14. *e.* If the inflammation be seated in the *peritoneum covering the psoæ and iliac muscles* — *Peritonitis psoitica* — *P. partiaria postica* — many of the symptoms already mentioned, with others which are proper to this seat, are complained of. Some of these occasionally resemble those attending hepatitis. Pain is felt in the back, sometimes obtuse, more frequently very acute. It is often referred to either flank, or to some part above the bladder on one side. An obtuse pain, occasionally with numbness, passes through the groin to the thigh, which the patient cannot stretch out without an increase of suffering. The urinary functions are not disturbed, and the bowels are not obstructed. There is more or less tenderness on pressure, according to the situation and severity of the inflammation.

15. *f. Dorsal Peritonitis* and *Mesenteritis* — *Peritonitis dorsualis* — *P. mesenterica* — are the most obscure of the several varieties of peritonitis; but it is very rare to observe inflammation of the peritoneum covering the dorsal and lumbar spine without the mesentery and intestines being more or less implicated. When the disease originates in this situation, acute pain is felt along the spine, which is much increased upon extending or straightening the trunk, or upon drawing it upwards or backwards, upon extending the limbs, and upon firm pressure of the abdomen. The febrile symptoms are most severe, with marked affection of the stomach and bowels. (See art. MESENTERY — *Inflammation of.*)

16. *g.* The *omentum* may be the principal seat of the inflammation — *Peritonitis omentalis* — *Epiploitis* — *Epiploïte*, Fr. — but it is extremely difficult to distinguish this state of the disease from that which is more or less extended. Indeed general peritonitis commonly implicates the omentum; and this is more particularly the case in the asthenic and puerperal states of the disease. Or, if peritonitis commences in this situation, it rapidly extends in the way already indicated, to all the parts coming in contact with the inflamed omentum. J. P. FRANK states that, in true epiploitis, the epiploon is generally greatly thickened, and that he has seen it in several instances upwards of an inch in thickness. Omentitis is usually attended by acute burning pain of the anterior part of the abdomen, above and below the umbilicus, but chiefly between the epigastrium and umbilicus, with extreme tenderness, a sense of tension, slight hardness, and marked swelling; and by acute symptomatic fever; but, these symptoms are also present in most cases of general peritonitis, of which, however, omentitis is often a more or less considerable part.

17. Omentitis may be *associated* with inflammation of one or more of the contiguous viscera, as of the liver, stomach, colon, or small intestines, and by the symptoms more especially belonging to such complication. Indeed simple omentitis rarely occurs, unless in connection with some cases of hernia; it being usually associated with inflammation of contiguous portions of the peritoneum. It should also be recollected, that the most severe cases only of omentitis present the acute symptoms just mentioned; and that slighter or *sub-acute* cases sometimes occur, in which the symptoms are milder, but more insidious and equivocal. I have even met with omentitis in a *chronic state*, and nearly limited to the omentum, with the exception of some adhesions to contiguous parts of the peritoneum, covering portions of the bowels and abdominal parietes. These

cases have been generally in females somewhat advanced in life, and chiefly in those who have been subject to *umbilical hernia*. The *adhesions* consequent upon omentitis and the extension of the inflammation to contiguous portions of the peritoneum, may become, even at a remote period after the recovery of the patient, the cause of internal strangulation of a portion of intestine. Many instances of this occurrence might be adduced if it were necessary.

18. Omentitis, in a very acute form, often extending to contiguous parts of the peritoneum, is frequently observed in the course, or as a consequence, of *hernia;* and when the hernia consists of a portion of omentum and becomes strangulated, the inflammation thus induced often terminates in gangrene, which is either limited to a part of the omentum, or is extended to parts of the peritoneum and intestines. Omentitis may likewise, in either an acute or sub-acute state, terminate in *suppuration*. In this case the matter may find its way, by perforation, into the bowels, or externally through the parietes of the abdomen. J. P. FRANK states, that he has met with instances of this kind, but they are very rare.

19. *B.* GENERAL PERITONITIS.—The more general states of peritonitis, occurring in a person of good constitution, or in a sthenic form, usually commence with rigors or chills, more or less severe and prolonged, with acute pain, soreness and tenderness in the abdomen, and aching in the back or limbs. The abdominal pain soon becomes the chief symptom; and is sharp, burning, pungent, or cutting, and is attended by a sense of tension, or of heat and distressing distension. It is aggravated by pressure, by efforts to vomit, or to pass a stool, or to pass the urine, or even by the slightest movement in bed. The patient cannot endure the weight of the bed-clothes, or of a fomentation. He lies on his back with his knees drawn upwards, thereby favouring relaxation of the abdominal muscles, and removing a part of the pressure of the bed-clothes from the abdomen. In some cases the pain is less acute, or remits somewhat for a short time, and returns with much severity. In others it is felt chiefly on pressure, or upon any effort; and more acutely after intervals, or when flatus is passing through or distending portions of the intestines. The pain is usually most severe about the umbilicus, or between this place and the hypogastrium; but it continues most acute at the part where it commenced, even when it extends most rapidly over the abdomen, which is hot, distended, and flatulent.

20. As the disease advances and is extended, the pain is increased by respiration, which soon becomes short and superficial. There are also nausea, frequent retchings, and vomiting of the fluids taken, with mucous matters, and sometimes with bile, more or less thirst, and generally constipation. The tension of the abdomen is at first attended by a marked contraction of the abdominal muscles, under the hand of the physician, owing to the increased sensibility being attended by augmented susceptibility, and disposition of the muscles to contract energetically, when the sensibility is excited. Subsequently, or after a day or two — seldom later, but often after a few hours only — the feeling of tension is attended by much distension, which varies in amount, and in the rapidity of appearance, with the intensity, and the general diffusion of the inflammation. The circumstances proper to the patient, however, modify the distension considerably; it is greatest in females of a relaxed habit of body, and soon after parturition; and least in males, of a spare habit of body, with strong or rigid muscles. In this state or form of peritonitis the abdominal distension is equal throughout; any irregularity which may be felt arising chiefly from muscular contractions under the hand of the examiner.

21. *Percussion* can hardly be endured; but at an early period, the clear sound which is emitted evinces that the distension is owing to the accumulation of flatus; but this sound becomes more dull as the disease advances, particularly in more depending parts of the abdomen, owing to the collection of serum, whilst it still continues clear, or even more so, around or above the umbilicus. The ear or stethoscope applied in different parts of the abdomen sometimes detects a rubbing or friction-sound similar to that often heard in pericarditis or pleuritis; and this sound is caused by the motions of the opposite inflamed surfaces during respiration.

22. The countenance is pale, expressive of anxiety and suffering, and the features are sharpened and sunk. The patient continues motionless on his back, the least inclination to either side increasing his suffering; and he is afraid of quenching his thirst, lest vomiting should ensue and augment his distress. Respiration becomes more short, frequent, interrupted, and shallow, the action of the diaphragm increasing the pain. The pulse is frequent, small, constricted, or hard. The skin is hot and dry; the urine scanty, high-coloured, and often turbid.

23. The *course* of general sthenic peritonitis is usually rapid, and characterised by a progressive aggravation of the symptoms; especially of the tenderness, tension, and swelling of the abdomen; and of the sickness and vomitings. The pain and tenderness become more general, and diffused through the abdomen, extending to the back and loins; the face paler and more sunk; the anxiety and distress greater; and the pulse and respiration smaller and quicker. Having reached its acmé, the disease may continue for one, two, or three days, or even longer, nearly stationary, but with irregular exacerbations and remissions. Having, however, become general and thus far advanced, it most frequently is not the less fatal, even when prolonged, as it sometimes is, to seven or eight days. General peritonitis, however, often runs its course in a much shorter period — in three or four days, or even in less time; but this rapid termination occurs most frequently in the *asthenic* and *puerperal* states of the malady.

24. II. ACUTE PERITONITIS presents certain VARIETIES OF MODIFICATIONS requiring particular notice. The most remarkable of these occur in the *puerperal states*, — *Puerperal Peritonitis*, — but, as they present so many peculiarities, and are so often complicated with other affections connected with these states, I shall treat of the puerperal forms of peritonitis in connection with those maladies with which they are so often associated, under the general head of PUERPERAL DISEASES.

25. Some authors have noticed what they have denominated *bilious* and *nervous forms* of perito-

nitis; but these require merely a passing notice. The *former* of these is merely peritonitis occurring in connection with an accumulation of bile in the biliary organs, and its discharge, chiefly by vomiting, during the course of the disease. The *latter* is characterised by a more than usual predominance of nervous symptoms — of acute pain, of low delirium or of convulsions, of restlessness, and lastly of coma with subsultus of the tendons. It is obvious that these modifications are dependent upon previous disorder and temperament, and may appear in either the sthenic or asthenic forms of the malady.

26. i. ASTHENIC GENERAL PERITONITIS — *Erythematic or Erysipelatous peritonitis* — most frequently occurs in the puerperal states, and will receive due attention in connection with these states.—*a*. But it sometimes occurs independently of these, in debilitated and broken-down constitutions; in cachectic habits; in connection with erysipelas, or with morbid states of the circulating fluids; in the course of exanthematous, adynamic or other fevers; after spontaneous perforation of the stomach or intestines, or even of any portion of the peritoneum; and after the operation of *paracentesis abdominis*. Under these diverse circumstances asthenic peritonitis presents varied phenomena, as respects both the local and the constitutional symptoms. Still it exhibits many, and these the most characteristic, that are common to all circumstances; and chiefly the appearance of symptoms diagnostic of it after previous disorder, or during a state of ill health; its often sudden accession and rapid progress, and frequently without previous or concomitant rigors or chills; the greater softness, rapidity, smallness, and weakness of the pulse; the cachectic or even livid hue of the countenance and general surface, as when it occurs in the progress of fever; the almost sudden distension of the abdomen, and indication of serous effusion into the peritoneal cavity; the more profound prostration; and the rapid supervention of singultus, with frequent regurgitation of the contents of the stomach, coldness and dampness of the extremities, and other fatal symptoms.

27. *b*. When the peritonitis results from *spontaneous perforation* of any portion of the *digestive canal* (see DIGESTIVE CANAL, § 42.), or from perforation of this membrane covering any of the abdominal viscera, by tubercular softening, disease, or rupture of vessels, or other lesions affecting the organs over which it is reflected, it is usually excited by the escape of fæcal, morbid, or other matters into the peritoneal cavity; and although these matters may not extend much beyond the place through which they passed, yet they excite a spreading or asthenic inflammation, attended by a copious, turbid, serous, or seroalbuminous effusion, the constitutional powers being incapable of forming coagulable lymph, or such as can agglutinate the opposing surfaces, and thereby limit the extension of the inflammation or prevent the diffusion of the matters passed through the perforation over the peritoneum. In all these cases, the pain and tenderness are first referred to the seat of perforation, which is most frequently in or near the right iliac region; but they rapidly extend, and are followed by all the symptoms just mentioned, which always terminate fatally, sometimes within twenty-four hours, and seldom later than two or three days.

28. *c*. Peritonitis from *paracentesis abdominis* usually presents similar characters, and pursues the same course as that just noticed. It is one of the most frequent varieties of asthenic peritonitis, and is almost uniformly fatal. It is very closely allied in its symptoms and progress to that state of the disease which has been denominated *erysipelatous peritonitis* by some pathologists, from the connection sometimes subsisting between erysipelas and asthenic peritonitis. Indeed the connection is sometimes obvious, as when erysipelas attacks the parts punctured in paracentesis, as it sometimes does, particularly when it is prevalent in a hospital, or is epidemic in the locality. In rare cases, also, asthenic peritonitis occurs on the subsidence of erysipelas from external parts of the body. I have met with an instance of it consequent upon the disappearance of erysipelas from one of the lower extremities; and Dr. ABERCROMBIE mentions another. In these, the patients complained of acute pain through the abdomen, with tenderness on pressure, great anxiety, and restlessness; death taking place within thirty-six hours. On *dissection*, the appearances were nearly the same in both instances; the intestines were all distended by flatus; the peritoneal surface was of a dark red, passing to a dull leaden colour, and the cavity contained much turbid serum, somewhat reddened, or of a sanious hue.

29. ii. *Hæmorrhagic peritonitis* has been noticed by BROUSSAIS and others; but it is extremely rare. It is not, however, to peritonitis consequent upon rupture of a blood-vessel, or of a viscus, as of the spleen or liver, that this term has been applied; but to asthenic peritonitis occurring in the hæmorrhagic diathesis, and attended by an exudation of blood from the capillaries of the peritoneum, without rupture. I have never met with a case of this form of peritonitis; but BROUSSAIS states that the symptoms are inflammatory at the commencement, and rapidly pass into those indicating great depression of the powers of life; the pulse soon becoming rapid, small, and soft; and death quickly supervening, with convulsions, cold and damp extremities and surface, and the other symptoms attending the fatal sinking of the asthenic and other states of the malady. The effused blood remains fluid, is mixed with serum, and the peritoneum appears generally affected.

30. iii. *Latent peritonitis* occurs sufficiently often to deserve notice at this place, although less frequently than is supposed by some writers. Indeed it is very rarely that the disease remains latent when it occurs primarily, and perhaps never, when it affects a robust or previously healthy person. It is chiefly when peritonitis attacks persons who are exhausted, cachectic, or otherwise diseased; or who are labouring under some other malady which attracts the chief attention, or who are maniacally or otherwise insane, that the characteristic symptoms are either imperfectly developed, or overlooked from their slight or mild form, and from the more prominent affection of a distant part. It is chiefly from the absence of pain, tenderness, and pyrexia, and from the insidious progress of the disease, that the nature of it is unsuspected. The appearance and expression of the features; an attentive examination of the abdomen by pressure, percussion, &c.; and the position of the patient in bed, will gene-

rally disclose, without much doubt, the nature of the malady.

31. iv. THE TERMINATIONS *of acute general peritonitis* are much influenced by the predisposing and the exciting causes; by the state of the patient at the time of attack; by the particular form the disease may assume; and by the several circumstances and influences to which the patient has been or is subjected.—*a. Resolution* of the inflammatory action sometimes occurs, and chiefly when the disease is of the sthenic form, is of a mild character, or less intense than that described above (§ 19.); or, although equally severe with it, if the symptoms become ameliorated by treatment. A diminution of pain, tension, and tenderness; less frequent retchings; an improved state of the pulse and of respiration, and a more natural expression of countenance, are favourable indications, especially if they are accompanied by perspiration, a more copious secretion of urine, and freer alvine evacuations.

32. *b.* In many instances of resolution of sthenic peritonitis, evidence of *adhesions* having formed between parts of the contiguous surfaces, is furnished in the continued tenderness or pain, increased by pressure, or accidental shocks, or quick motion, or by turning in bed, that is felt in one or even more parts of the abdomen; although the patient may apparently have nearly, or even altogether recovered. That these symptoms result from adhesions has been proved by the subsequent history of some cases of this kind; these adhesions becoming the cause of internal strangulation of a portion of intestine, of partial peritonitis, and of the patient's death. In other instances the inflammation, instead of being completely resolved, is only abated, the symptoms gradually subsiding in severity, without recovery taking place. In these the acute passes into the *chronic disease* (§ 36.).

33. *c. Effusion* of serum, or of sero-albuminous, or even of sero-sanguineous or sero-puriform matter, more rarely the latter, into the peritoneal cavity, is rather a consequence than termination of the disease. At an early stage the *effusion* is slight, but at an advanced period, and as the powers sink, it becomes more and more copious. The abdominal pain and tension then subside or altogether cease; the abdomen being soft, relaxed but tumid, and dull on percussion, excepting at its most elevated part, where the sound emitted indicates flatulent distension of the intestines. Fluctuation is sometimes remarked, but occasionally it is obscure, or not evident, owing to the effusion being either traversed by adhesions, or existing between the folds of the mesentery and convolutions of the intestines, or gravitating to the iliac and pelvic regions.

34. *d. Gangrene* very rarely occurs in general peritonitis, even when it is most asthenic in its nature. It appears chiefly when the disease commences partially, as in the appendix of the cæcum, or from strangulation or local injury. Its occurrence is indicated by sudden cessation of the pain and tension of the abdomen; by hiccup, and by coldness and clamminess of the extremities and general surface; by rapid, weak, small, thready, and intermittent pulse; and sunk, dark, and Hippocratic countenance.

35. *e. A fatal issue* may be the consequence of effusion and its effect upon the system, in connection with the extent of lesion, and, in rare cases, of incipient gangrene. But it most probably chiefly results from the shock or influence produced upon the vitality of the frame, by the great extent of the inflammation and consequent lesions; and this is especially the case when the disease is intense, and the peritoneal surface extensively affected at its commencement, for in these cases the powers of life most rapidly sink, especially when the malady presents an asthenic character. Where effusion is not extensive, and consists chiefly of serum, or of a sero-albuminous fluid, it does not necessarily occasion death, the patient sometimes recovering; the fluid being absorbed and partial adhesions still remaining, or the disease passing into the *chronic form*.

36. A fatal issue occurs chiefly when the more intense cases of the sthenic form of the disease have been neglected at their commencement, and the more unfavourable consequences of inflammation have supervened before the treatment has commenced. In these, this issue usually takes place at periods varying from two or three to eight or nine days. In the several varieties of asthenic peritonitis noticed above, this issue generally occurs, unless in a few instances, where the disease is judiciously treated at its commencement, in from one to two or three days. This *termination* is preceded and indicated by increased alteration of the countenance; by greater rapidity, weakness and smallness, or irregularity of the pulse; by coldness and dampness of the extremities; and by more frequent vomitings, the contents of the stomach being rejected without retchings or effort, and by mere regurgitation. On the accession of these unfavourable symptoms, the state of the respiration and the occurrence of singultus indicate the extension of the disease to the diaphragmatic peritoneum. The patient is now sometimes restless or oppressed, and the breathing is laboured or thoracic; but he still lies on the back, and makes no effort to move, even when fluids are regurgitated from the stomach, these being thrown over his person and the bed-clothes. The matters thus ejected are fluid, with some mucus and green bile. He soon afterwards either sinks into a state of coma, quickly terminating in dissolution, or he is attacked by convulsive movements, with difficult or laboured respiration, spasms of the diaphragm, and asphyxia; or he sinks with all the indications of vital exhaustion.

37. III. CHRONIC PERITONITIS.—This form of the disease was not duly recognised and investigated until the commencement of the present century. BICHÂT was the first who distinctly and correctly noticed it, and Dr. PEMBERTON subsequently described one of its forms. Soon afterwards, Dr. BARON fully illustrated the tubercular variety of chronic peritonitis; and about the same time BROUSSAIS, MONTFALCON, GASC, and the Author, further investigated the disease. Although overlooked as an idiopathic and distinct malady, by writers of the seventeenth and eighteenth centuries, still cases illustrative of its nature are to be found in the works of many of them, as shown in a memoir published by me many years ago, containing the history of some cases of it which had occurred in my practice. The writings of COLUMBUS, FANTONIUS, FERNELIUS, BALLONIUS, TULPIUS, LOMIUS, BONETUS, TISSOT, HOFFMANN,

BURSERIUS, and MORGAGNI, at the places mentioned in the *Bibliography*, furnish some interesting cases and remarks, illustrating the history of chronic peritonitis, and showing how frequently this malady was confounded with colic and mesenteric disease.

38. i. The HISTORY *of our pathological knowledge of chronic peritonitis* must nevertheless be considered as very limited. Although the medical writers of the two last centuries furnish no accurate description of this highly dangerous disease, yet their writings are not altogether deficient in proofs of a partial acquaintance with its nature; but they failed in recognising the lesions found on dissection of fatal cases as the results of chronic inflammation. COLUMBUS (*De Re Anatom.*, lib. xv.) describes "Conglomerationem intestinorum, natam videlicet ex ultimis ilei partibus una complicatis, tumoremque in hypogastrio exhibentibus." And MORGAGNI adduces several cases (*Epist. Anatom. Med.* 39. sect. 24—32.) in which he found the intestines agglutinated into one mass, and their coats possessed of an almost cartilaginous firmness. One of these cases occurred after ascites, and sufficiently marks the acute nature of the dropsical affection. TULPIUS (*Observationes*, lib. iv. p. 348.) mentions a similar instance in a female who had been affected from an early age with ascites: upon dissection, the peritoneal coverings were every where thickened to such a degree as to equal that of the ring finger.

39. MORGAGNI, when adducing the cases just referred to, mentions others from preceding writers, which are, as well as those seen by himself, illustrations of chronic peritonitis occurring without tubercular formations. He describes these cases as unfavourable results of prolonged or repeated attacks of colic and of ascites; and he describes others as forming varieties of abdominal tumours, owing to the thickening and induration of the peritoneal coat, and the agglutination of the intestines to each other and to one or more of the other abdominal viscera.

40. It is singular, however, that MORGAGNI, with all his pathological knowledge, did not attribute the changes in the peritoneum which he has so fully and even frequently described, and with which he occupies nearly the whole of his thirty-ninth epistle, to inflammation. He is very much puzzled to account for the changes, now universally ascribed to chronic inflammatory action, and enters upon a somewhat lengthy disquisition (sect. 31.) in explanation of it. He ascribes the pain to flatulent distension of the bowels; and the agglutination of the opposite surfaces to the pain and distension, which he considers to have caused an exudation of a glutinous matter from these surfaces. The thickened and indurated state of the peritoneum, often found in connection with more or less serous effusion, he imputes to the effect produced upon this membrane by its prolonged maceration in an acrid or morbid serum. When adverting to the symptoms, he remarks, "Pulsus humilis et debilis potius, et qui, si bene attendas, sibi obscure, dissimilis sit: abdomen autem tensum, et durum, et cum dolore quodam; facies denique insoliti aliquid, sed in aliis aliud, ostendens," &c.

41. HOFFMANN, after describing the more acute affections of the intestinal tube which terminate either fatally or in health, in a very short time, mentions those of a chronic character, which he denominates "dolores chronici, vel colicæ diuturnæ." He describes them as continuing during many weeks, and even for the space of a twelvemonth, with various intermissions and exacerbations. On dissection, "the intestines are found constricted, their coats thickened, callous, and scirrhous," &c. (*De Intestinorum Doloribus*, sect. ii. cap. v. p. 180.)

42. Other instances could be also adduced, from BONETUS (sect. xxi. *Observat.* 3—8.), from FANTONIUS (*Observationes, Epist.* 4.), and from the Acta Academ. Nat. Cur. (tom. i. Observat. 87., et tom. vi. Observat. 124.), in all of which the intestines, omentum, and mesentery, were accreted into one mass. BURSERIUS mentions similar cases, which he considered as arising from an "arthritica, rheumatica, herpetica, scorbutica, vel scabiosa materies, retropulsa." Speaking of these diseases, which he denominates "intestinorum conglomerationes," he remarks, "Similem (conglomerationem) vidi in muliere colica chronica jamdiu afflicta, et demum marasmo confecta." (*Institutiones Medicinæ*, vol. iv. p. 362, *et seq.*)

43. JODOCUS LOMIUS furnishes some remarks which may be referred to this disease. "I find it observed," he says, "by some learned men, that the peritoneum, or at least those membranes which cover the abdomen and parts of the belly, are likewise afflicted with very grievous pains. These pains, although they in nowise belong to the colic, yet they are equally violent. And these, as they are very severe, so likewise are they very long, and yield to none of those remedies which are proper in the colic, whether medicines, fomentations, and clysters; but generally succeed long fevers, and those kinds of bilious diseases which are not easily solved, and have been often observed to terminate, as it were critically, continued fevers, as well as tertians and quartans. The mesentery may also be seized with an inflammation; at this time there is an inward weight, but no manifest pain; a fever arises, but this is moderate," &c. (*Observat.* p. 316, *et seq.*)

44. It is not, however, to the scanty details furnished by the earlier writers in modern medicine, that we are to attribute the progress made in our knowledge of the pathology of chronic peritonitis; but to the researches of BICHÂT, PEMBERTON, BARON, BROUSSAIS, MONTFALCON, GENDRIN, GASC, SCOUTTETTEN, and HODGKIN, that we are chiefly indebted. Up to the time of the earliest of those writers, this disease was confounded, as I have now shown, with colic, mesenteric affections, or tumours of the omentum. And it is very probable that the varieties of colic, particularised by many of the older writers under the appellations arthritica, rheumatica, scorbutica, metastica, inflammatoria, symptomatica, diuturna, chronica, endemica, &c., were actually chronic inflammations of this membrane, the disease occurring in the manner indicated by those specific names. In addition to this catalogue of names, others from the same and different authors may be mentioned, as constituting varieties of colic, as colica herpetica, C. ex scabiosa materie retropulsa; C. ex perspiratione retenta, atque ad intestina translata; C. mesenterica, &c., which, most likely, were truly affections of a slow inflammatory nature, attacking this membrane, and either simple or

primary, or associated with tubercles. Fernelius appears to have been of this opinion; he says,— "Ab acri vero erodentique humore, aut etiam ab inflammatione quisquis ortus fuerit, dolor colicus fixus etiam est, sed cum febricula, ardore, siti et vigiliis; irritatur esculentis potulentisque calidioribus, a quibus etiam sumpsit originem." And again "Alii insuper cruciatus quadam similitudine et vehementia colici nuncupantur, quibus tamen non in colo intestino sedes est; sed vel in peritonæum vel in membranis quæ abdomini ventrisque partibus obtenduntur. Hi sane gravissimi sunt, et admodum diuturni, ac neque clysteribus, neque medicamentis, neque fomentis, neque iis remediis quibus qui vere sunt colici dolores, deliniri solet." (Fernel. *Pathol.* lib. vi. cap. vi. p. 159.) Although Willis did not consider colic to be an inflammatory disease, he believed the part primarily affected by it to be the mesentery, "which is highly sensible," he adds, "and through which a morbific matter is conveyed, not by means of the arteries, but by the nerves, and its seat is not the proper coats of the intestines." (*Pathol.* p. 11. c. xv.) Many a case of chronic peritoneal inflammation probably is, even in the present day, taken for colic, but more especially for diseased mesenteric glands; the size of the abdomen, its irregular hardness, with the hectic, emaciated limbs and dry foul surface, being symptoms, which may readily be mistaken, if not carefully inquired into, for those of the latter affection. Indeed, disease of the mesenteric glands may be induced by continued irritation, existing primarily in the serous membrane; and, in the tubercular form of chronic peritonitis, I have shown that tubercular disease of these glands is often also present. It may be also granted, that disease sometimes takes place in these glands, coetaneously with morbid action in either of the mucous or serous membranes, in consequence of, and depending upon, the nervous influence supplying the capillary vessels distributed to those textures, and upon the state of the circulating fluids; chronic inflammation with tubercular productions resulting therefrom in scrofulous constitutions.

45. Chronic peritonitis not unusually supervenes on continued exanthematous and remittent fevers. I have met with several instances of this connection. Tissot (in his dissertation *De febribus biliosis*, p. 143.), mentions an affection following fever which continued for many months. He gives the following characteristic symptoms: —"Accessit diarrhœa sæpe recurrens, tumet frequenter tympaniticè abdomen, et fere semper dolet, ita ut minimam vestium constrictionem fere nequeat; deletur prorsus appetitus; urget sæpe sitis; parvus est somnus; urinæ paucæ, turbidæ." This case evidently puzzled Tissot; for he asks "Quænam causa morbi? He adds, "Tabes succedat, tympanitis, ascitis, icterus, mors." He makes no mention of any dissection. Chronic peritonitis may follow acute dysentery; and even during the continuance of the chronic form of that disease, from an extension of the inflammatory action to the serous membrane. I have met with several instances of this occurrence in the course of practice; and they are often seen in climates where dysentery is endemic; and many cases are recorded by writers in the last century that illustrate this succession.

46. Although chronic peritonitis sometimes occurs as a secondary affection, and is complicated in the manner just alluded to, it appears also as a primary disease. This independence of inflammation of the peritoneum of disease of the contiguous structures did not escape the penetrating mind of John Hunter. "If the peritoneum," he says "which lines the cavity of the abdomen, inflames, its inflammation does not affect the parietes of the abdomen; or if the peritoneum covering any of the viscera is inflamed, it does not affect the viscera. Thus the peritoneum shall be universally inflamed, as in the puerperal fever, yet the parietes of the abdomen, and the proper coats of the intestines, shall not be affected. On the other hand, if the parietes of the abdomen, or the proper coats of the intestines are inflamed, the peritoneum shall not be affected." (*On the Blood and Inflammation*, p. 244). Bichât remarks— "L'affection d'un organe n'est point une conséquence nécessaire de celle de sa membrane séreuse, et reciproquement, souvent l'organe s'affecte sans que la membrane devienne malade," &c. (*Anat. Générale*, vol. i. p. 551). And Sprengel observes—"Neque facile ad reliquas intestinorum tunicas transit adfectus hujus externi velamenti, unde peritonæi inflammationes sæpius observamus sine ullâ inflammatione tunicarum musculosarum et nervearum." (*Institut. Physiol.* t. i. p. 343.)

47. ii. Description.— *Chronic peritonitis* appears in *two distinct forms:* 1st. It occurs *primarily*, and then generally gradually and insidiously, and most frequently in connection with tubercular formations; 2d. It appears *consecutively*, or succeeds to the acute form of the disease, or to inflammation of some viscus that has extended to the peritoneal covering. As in the acute form, so in this, the inflammation may be either *partial* or *general*. It is most frequently the former when it proceeds from local injury, or from inflammation of a subjacent viscus; and it is often general when it is granular or tubercular, or is associated with serous or dropsical effusion: but the general, as well as the partial state of the malady, may be consequent upon some other disease, particularly dysentery, enteritis, hepatitis, inflammation of the uterus and its appendages, &c. Dr. Baron and M. Louis concluded that chronic peritonitis, occurring primarily, is always associated with tubercles. As early as 1821, I combated this opinion, and adduced two cases which were exceptions to the law which these pathologists believed to exist. More recently Dr. Hodgkin has stated that the form of peritonitis which is accompanied with copious effusion, occurs without any tubercles; and the same may be said of other cases, in which the concrete product of inflammation had been more considerable. However, it must be admitted that chronic peritonitis appearing independently of injury, of rheumatism, of visceral disease, or of cutaneous eruptions, is generally tubercular, and is observed chiefly in scrofulous constitutions; and that when it is consecutive of these maladies, or appears from the suppression of external affections, it is rarely associated with tubercular formations.

48. *A. The symptoms* vary at the commencement of chronic peritonitis, with the exact nature, seat, and associations of the disease.— *a.* When it is *tubercular*, it is always insidious, slow, and often latent, until it is considerably advanced;

and soon after it is recognised, it often rapidly terminates fatally. At first there is often very little pain, and in some cases none at all. In others, griping or colicky pains are occasionally felt, and frequently after long intervals. A sense of broiling or burning heat is complained of in the epigastric and umbilical regions. The bowels are irregular, more frequently relaxed than confined, the excretions being offensive, deficient in bile, and otherwise morbid. Nausea is is often complained of, but vomiting is not frequent unless at an advanced stage of the disease. The matters thrown up are fluid, with mucus and a little green bile, and are more or less acid. The urine is scanty, high-coloured, and deposits a reddish sediment. The tongue is usually red, glazed, and chapped; its surface being often slightly fissured and uneven. The surface of the body is foul, lurid, and dry, but perspires freely during the night. The pulse is quick, small, and weak. The body is always more or less emaciated; the countenance and eyes are sunk; and the extremities cold, attenuated, and slightly livid or dark. A livid or dark circle surrounds the eyes; and the face and whole body appear as if faded or blighted.

49. The *abdomen* is always large or tumid, relatively to the rest of the body, particularly at an advanced period of the malady. If the peritoneal cavity contains any fluid secretion, slight or obscure fluctuation will be detected, and there will be dulness on percussion, particularly in more depending situations. When pressing or kneading the abdomen, a doughy state is remarked; and the inclosed viscera and the abdominal parietes feel as if they constituted one mass. Tenderness is often not considerable; but it varies and is more remarkable in one part than in others, and the seat of it varies in different cases, and even in the same patient at different periods. The abdomen often presents irregularities, which are sometimes mistaken for enlarged mesenteric glands. These irregularities are generally owing to the development of larger tubercular masses, accreting the intestines, and occasionally by scybalæ in the cells of the colon. These masses of tubercular accretion are often more manifest on examination, when a fluid effusion has been removed by absorption.

50. Tubercular peritonitis is often insidious and slow in its early stages, and may thus be almost *latent* until shortly before death. In these cases, however, there have been generally an irregular state of the bowels, sometimes nausea, morbid evacuations, and more or less emaciation. But these have proceeded without creating alarm, as they were attended by little, or only occasional pain. At last the emaciation, the blighted appearance of the system, and the relaxed state of the bowels, attract attention; or acute symptoms are suddenly complained of, especially acute abdominal pain, increased disorder of the bowels, vomiting, and rapid sinking of the vital powers. As soon as these symptoms supervene, the disease proceeds with variable rapidity to a fatal issue.

51. In a few cases the abdomen seems more flat than usual; but is then always duller on percussion than natural. The surface of the belly is generally warm, dry, and of a livid or dark hue; and in many instances it is traversed by large blue, or distended veins, indicating impeded abdominal circulation. In addition to the inequalities just alluded to, the inguinal glands are generally enlarged, and painful on pressure. The diarrhœa, which was at first slight, occasional, and interrupted at times, or even alternated with slight costiveness, becomes more continued, and less under the control of treatment, for it then, as will appear in the sequel, is the result of ulceration. The stools are always unnatural, and contain undigested matters. Life is soon afterwards terminated by gradual exhaustion of its powers.

52. *b*. When chronic peritonitis is *consecutive* of the acute state, or when it appears from the metastasis of disease, or after visceral inflammations, or after suppressed eruptions, or when it is non-tubercular, although *primary*, it usually presents somewhat different phenomena. In these circumstances, the abdomen is the seat of a deep-seated but not very acute pain, which often intermits, and is either increased, or not much complained of unless upon pressure, or when the abdominal muscles are contracted, or when the trunk experiences a shock, as when taking a false step. Nausea and even vomiting are occasionally experienced, and digestion is always difficult, food oppressing the stomach, and producing pains in the abdomen as it passes through the intestines. In some cases, these pains are felt in a particular part, in others their seats vary. Constipation is often present at an early stage; it is subsequently alternated with diarrhœa; but, at an advanced stage, the bowels are much relaxed, and the stools morbid, sometimes containing undigested substances. Emaciation is considerable, and always greater as the disease advances. The countenance is sunk, anxious, pale, and sallow. The skin is dry, and unhealthy in appearance; the respiration is laboured, short, or quick; and the pulse is frequent, particularly towards evening and night. When the chronic disease follows the acute, the severe symptoms of the latter gradually subside and lapse into those attending the former, varying, however, with the exciting causes, and the circumstances developing the primary attack.

53. The state of the abdomen varies with the presence or absence of fluid effusion in the peritoneal cavity. When fluid is present, the abdomen is enlarged, often so as to contrast remarkably with the emaciated limbs; and it is tense, distended, dull on percussion, unless at the more elevated parts. Fluctuation is seldom very manifest, more frequently it is obscure. Occasionally œdema of the lower extremities, and of the more depending parts of the abdominal parietes, is remarked. When there is no fluid in the cavity, the abdomen often appears diminished rather than increased in size. In some it is quite flat; in others it presents a slight or an irregular swelling about the umbilicus, owing to the agglutination of the small intestines. It is generally somewhat dull on percussion; but not more so in the more depending situations. On careful palpation of the abdomen, the experienced examiner will readily feel that the suppleness of health is wanting, and is replaced by an internal resistance or tension, indicating the adhesion of internal parts, whilst the integuments are loose, and move readily over the more tense parts underneath.

54. *c*. Chronic peritonitis may be *partial* or *general*. The former occurs chiefly after inflammation of some abdominal viscus, that has ex-

tended to the peritoneal surface. In this case, the lymph thrown out upon that portion of this surface excites inflammation in a part opposite to, or coming in contact with that first affected; and thus adhesions, or thickening of the opposite parts, or both, may be produced, and the disease proceed no further; the patient dying at some subsequent period of some complication of this state of partial peritonitis, or of some disease developed at a more or less remote period.

55. *Partial chronic peritonitis* is sometimes observed after enteritis, after inflammation of the colon and dysentery, after chronic ulceration and perforation of the stomach or intestines, after hepatitis, and after inflammations of the urinary and sexual organs. When these maladies induce peritonitis in persons not remarkably debilitated, or otherwise of good constitutions and habits of body, the disease may not only proceed no further, but it may be so limited, or so latent, as not to give rise to distinctive phenomena indicating its existence; although slight uneasiness and pains, increased on sudden motions, jerks, or muscular actions affecting the abdominal viscera, or on pressure in certain directions, are often present.

56. When, however, peritonitis supervenes upon any of the above maladies affecting scrofulous, cachectic, or broken-down constitutions; or in persons whose excreting organs are torpid or diseased, and whose circulating fluids are contaminated or insufficiently depurated, it usually spreads more or less, and becomes even *general*; and, in these cases, is attended by more or less of fluid effusion, unless in children, young persons, and the scrofulous diathesis, where it is more frequently accompanied with tubercular formations.

57. *d. The terminations or consequences* of chronic peritonitis are those organic lesions which will be particularly described in the sequel, and which, although most extensive, cannot be individually distinguished by symptoms, as they are variously associated or grouped in most cases; and when either far advanced in their separate states, or associated, give rise to nearly the same phenomena, which are those characterising the advanced stage of the malady.

58. IV. PERITONITIS IN CHILDREN.— Peritonitis may occur even in the *fœtus*, and hence may be *intra-uterine*, and even *congenital*; but it much more frequently appears after birth, particularly between the second and eleventh years of age, and is one of the most important diseases of childhood. It may be either *acute*, *sub-acute*, or *chronic*; and it may be *simple* and *primary*, *tubercular* and *consecutive* or *complicated*. It may also be *partial* and *general*:— in other words, in either its acute or chronic states, it may be partial or general, and each of these may be primary and simple, or consecutive and complicated; and, further, any of these states may exist either with or without tubercular formations, although the chronic form is comparatively rarely seen unassociated with tubercles. Moreover, instances have occurred of simple or non-tuberculated peritonitis having been developed in the course of tubercular disease in other organs, as when simple acute peritonitis proceeds from perforation of the intestines or stomach, occurring in the course of tubercular consumption, or of intestinal diseases, associated with tubercles in various organs.

59. *A. Acute and sub-acute peritonitis* is more frequently a *consecutive* than a *primary* disease in children. It rarely occurs primarily and simply in the previously healthy: but most frequently in the course of, or during convalescence from, fevers, particularly eruptive fevers; and especially of those cases which have presented predominant disorder of the abdominal organs or diarrhœa. It may even occur in the advanced progress of the chronic form, and prove fatal in a short time.

60. *a. Pain* is generally the earliest symptom; and is often at first local or limited; but it soon extends over the abdomen, is increased by pressure and motion, and continues to the termination of the malady. *Vomitings*, which are frequent in the peritonitis of adults, are much less so in that of children, and often do not occur until an advanced period. The *bowels* are seldom much confined, particularly as the disease advances. They are more generally relaxed, and the stools become more frequent and morbid as a fatal issue is approached. *Respiration* is accelerated, but short and shallow. The *tongue* is generally moist, and covered by a whitish or yellowish coating. The *appetite* is lost, and there is always great *thirst*. The *countenance* is expressive of pain, anxiety, and distress. It is pale, collapsed, or sunk. *Nervous symptoms* are rarely observed, unless in very young children, and in these convulsions are the chief form they assume. The *position* of the patient is always on the back, with the knees drawn up.

61. *b.* The *abdomen* becomes tumified very soon after pain is first felt, is always tense, and then sonorous throughout upon percussion. When the peritonitis is *partial*, the swelling and tension are often confined to the situation affected; and this partial state of the disease is most frequently observed in the right flank, or in or near to the right iliac region. As the disease advances, the abdomen, particularly in the situation of any manifest tumours, becomes more dull than natural on percussion; but the tenderness often prevents this mode of examination from being practised. When the disease is general, flatulent distension increases and is more manifest. Fluid effusion is seldom clearly evinced by fluctuation. The surface of the abdomen is usually warmer than natural.

62. *c.* There is always more or less *symptomatic fever*, which is seldom ushered in by distinct rigors. The *pulse* is very quick, and commonly the quicker, smaller, and weaker, the more intense and the more general the disease. The urine is scanty and high-coloured, and voided frequently; the skin is hot, dry, harsh, and of a dull unhealthy appearance.

63. *d.* The *duration* of acute peritonitis varies from twenty-four hours to thirty-eight or forty days. When the disease proceeds from perforation of any part of the digestive canal, its duration is usually the shortest, as in adults. When it continues longer than thirteen or fourteen days, it is either partial, or presents a less severe or sub-acute character. When peritonitis *terminates* in *resolution*, the general or constitutional symptoms are ameliorated; the pain subsides or altogether ceases, and the abdomen gradually resumes its natural condition. The bowels become more regular, and the pulse slower and fuller. If much fluid effusion have attended

the inflammation, the abdomen is longer in resuming its former state. If the disease continue to advance to a *fatal issue*, the swelling and tension of the abdomen increase; the countenance becomes more sunk; the bowels more relaxed; the pain more severe and more general, and the pulse more rapid, smaller, and at last inappreciable.

64. *e.* Acute peritonitis is rarely associated with *tubercles* in children; but the chronic form is very often thus complicated. It sometimes, however, supervenes in the course of tubercular formations in other or even distant organs, especially of ulceration of the intestines, in connection with tubercular disease of the mesenteric glands, and of tubercular consumption; and it occasionally appears in the progress of the chronic disease, either simple or tubercular. In this latter case, acute symptoms are suddenly developed; the abdominal pains become more severe; the fever, the distension, and the heat of the abdomen are augmented; the pulse is more rapid, and smaller; and the countenance is more anxious and sunk. The disorder of the bowels increases, and, with the progress of the organic lesions, soon terminates life.

65. *B. Chronic peritonitis* in children is generally associated with tubercular formations, and is often then more or less general. It may, however, occur without this association, especially when it is partial, and consecutive of inflammation of one or more of the abdominal viscera. It may also follow the acute form of the disease, either from the natural decline in the severity of the attack, or from the treatment resorted to.

66. *a. Simple or non-tuberculated chronic peritonitis* can rarely be distinguished from the tubercular during life, unless the history and circumstances of the case be duly considered. When it seems to follow inflammation of some viscus, or the acute disease, in children of a previously healthy frame, and free from constitutional vice, then it may be presumed to exist independently of tubercles. As respects the symptoms, there appears hardly any difference between this variety and the tubercular, about to be noticed. In the former, however, distinct tumour, or inequalities in the abdomen, are more rarely or never observed; and there is often less dulness on percussion. In other respects, the phenomena and progress of both varieties are the same.

67. *b. Chronic tubercular peritonitis* in children is generally attended by *pain* from the commencement, often before the abdomen presents any swelling, although often also contemporaneously with swelling and tension. The pain is in some cases local, in others general, or erratic, but it is not when local or fixed always an indication of the chief seat of tubercular productions. The *tongue* is moist, white, or coated with a yellowish matter at its base; less frequently red and glossy. The *appetite* is frequently but little, or even not at all impaired; it is more generally irregular and capricious. It is sometimes not materially diminished throughout. *Thirst* is generally felt, and it increases with the progress and severity of the symptoms and associated affections. *Vomitings* rarely occur in this state of peritonitis, although they are not infrequent in the acute. *Diarrhœa* is commonly observed, and it increases as the disease advances, especially when ulceration of the intestines is present, and this is rarely wanting in the last stage.

68. The *abdomen* presents the most characteristic appearances. At an early period, its form presents little or no change beyond being somewhat more full and sonorous on percussion. As the disease advances, but at no definite period, the belly becomes distended, and is either sonorous throughout, or is dull in some parts and sonorous in others. When the dulness is found always in the same situation, and is attended by some hardness or doughiness, suspicion of the existence of the disease is generally well founded. In some cases an obscure fluctuation is felt in the more dull parts of the abdomen, owing to a partial fluid effusion attending the tubercular lesion of the peritoneum. With increased distension and tympanitic sound there is often more or less tension; which is sometimes greater in one side or part than in another; and when it is great, the part is elastic rather than hard. As the disease advances, particularly in older children, the abdomen presents many of the changes already noticed. When the tension is very great, the surface becomes smooth and shining, and afterwards harsh or scurfy, owing to desquamation of the cuticle. The veins in the surface of the belly are then often large and distended.

69. *c.* The *progress* and *duration* of this form of peritonitis vary remarkably in different cases. The disease is often far advanced before it excites alarm; and is mistaken for simple disordered function of the bowels, and the pains for those of colic. The flatulent state of the digestive organs generally attending, as well as preceding, the complaint, is frequently considered as the source of all the disorder until serious organic lesions are developed; and then *emaciation, febrile exacerbations, diarrhœa*, partial or general *night-perspirations*, and the symptoms just mentioned, disclose the nature of the malady. The *duration* of the disease can rarely be precisely determined, as the exact period of its commencement cannot often be ascertained. The patient has been frequently out of health for a considerable period before the symptoms were fully evolved; and it is most probable that the tubercular formations connected with the peritoneum commenced about the period of the earliest indication of impaired health. The continuance therefore of the malady may, according to my experience, vary from two or three to eight or nine months. Instances of a shorter or even longer duration may occur, but they can be very rare.

70. *d.* The *termination* of this form of peritonitis is always fatal. But this issue is not owing to the extent of the tubercular disease solely, but partly also to associated disease in other organs, to tubercular formations in other viscera, particularly in the lungs, in other serous membranes, in the mesenteric glands; to ulceration of the intestines, &c.

71. V. COMPLICATIONS OF PERITONITIS.—The several forms of peritonitis may be variously complicated. Peritonitis in the puerperal state, as will be shown in the article on PUERPERAL DISEASES, is most frequently complicated with disease in other organs and parts; but those states of peritonitis already considered are often also compli-

cated, although not so frequently and so extensively as those occurring after parturition. The *symptomatic fever* attending peritonitis can hardly be viewed as a complication, as it depends upon the previous health of the patient, the state of nervous or vital power, and the condition of the circulating fluids — depression of power and contamination or imperfect depuration of these fluids giving rise to an adynamic state of fever, and favouring the extension of the malady and fluid effusion. The *complications* of peritonitis are of two kinds: — 1st, those in which the peritonitis is a consequence of the disease with which it is associated; — and 2d, those which consist of extensions of the peritonitic malady. The former are the most numerous, frequent, and important.

72. *A.* When peritonitis supervenes on other visceral disease, and is thereby associated with it, the inflammation may be *limited* to a portion of the peritoneum, or *extended* more or less generally; the limitation or extension depending upon the states of vital power, and of the circulating fluids, as already specified (§ 4.).

73. *a.* The complication of *hepatitis* with peritonitis is generally with the *partial form* of the latter, the former being the primary malady. In this association, as will appear by referring to LIVER — *Inflammation of*, the diaphragmatic, or the parietal peritoneum, or other contiguous portions, may be affected; and recovery from it is frequent, adhesions between the opposite surfaces only remaining, and these ultimately become more cellular and less extensive. The association of *splenitis* with partial peritonitis, in a slight and chronic form, giving rise to adhesions, &c., is not infrequent, especially in marshy situations.

74. *b.* The complication of *gastritis* with peritonitis is much less common than that of hepatitis, but, like it, is much more frequent in warm than in temperate climates. It is, however, a much more severe and dangerous malady. The symptoms are violent; the vomiting is almost constant; the vital depression extreme; and the progress to a fatal issue generally rapid. In the few cases of this complication that I have observed in this country, the peritonitis has been partial.

75. *c.* The association of peritonitis with *enteritis*, or with *inflammations of the cæcum* or *colon*, is not infrequent, particularly in warm climates; and, in persons who have migrated from Europe, it is more commonly observed than in natives. In all such cases the disease generally commences in the mucous surface of some portion of the intestinal canal, and extends through the other tunics to the peritoneal coat, agglutinating the opposite surfaces of the bowels with each other, or with those of other organs or parts. In cases of inflammation of either the small intestines, the cæcum, or colon, the resulting peritonitis is most frequently partial, the disease sometimes terminating rapidly in gangrene, especially when the *appendix cæci* is affected, or when strangulation exists. When, however, there is perforation of a portion of bowel, or when this complication occurs in the course of exanthematous or continued fevers, or of dysentery, the disease of the peritoneum is more or less general, and is rapidly fatal, as described above (§ 27. *et seq.*).

76. *d.* The association of peritonitis with *diseases of the sexual and urinary organs*, or with inflammation of any of these organs after surgical operations, often occurs, particularly in persons of a bad state of health or constitution. The peritoneal inflammation may be partial or general, sthenic or asthenic; but, when general, it is usually also asthenic; and it may be associated either with hysteritis, cystitis, nephritis, or with inflammation of the ovaria or fallopian tubes, or with any two or more of them. These complications are almost always present in puerperal peritonitis, and are also sometimes observed in other circumstances. Partial peritonitis not infrequently follows inflammatory and organic diseases of the uterus and ovaria; and when thus associated, or when complicated with inflammation of either the sexual or urinary organs, sometimes terminates favourably, adhesions of contiguous surfaces, however, generally remaining in these, whilst serous effusions take place in the more unfavourable cases.

77. *B.* Complications seldom arise from *the extension of peritonitis to the organs which the peritoneum invests;* for when the peritonitis is general and acute, death commonly takes place before inflammation in a distinct form, or other organic change, is developed, in any of these organs; and when the peritonitis is partial or chronic, the affection of contiguous or inclosed viscera is more functional than structural. In children, however, and even in adults, both partial and chronic peritonitis may be associated with mesenteric disease, or with tubercles in the mesenteric glands and in the lungs. In these cases, also, there may be a further complication with ulceration of the intestines; the ulceration sometimes perforating the coats of contiguous convolutions of intestines, and forming fistulous communications between them. It is doubtful, however, whether the peritoneal inflammation or the tubercular formation be primary; it is even not improbable that the former is the consequence of the latter in some instances, although the existence of tubercles in the false membranes, or within the peritoneum, shows that the inflammation has preceded the tubercular productions. In many cases of chronic tubercular peritonitis, the ulcerations and other lesions of the intestines are manifestly consequences of the peritonitis, whilst in others the ulceration seems to be primary, or the sequence of organic lesion cannot be readily established.

78. *a.* When peritonitis commences about the liver and extends to the diaphragmatic peritoneum, the *pleura* of the same side not infrequently also becomes inflamed, partial peritonitis thus becoming complicated with *pleuritis*, and ultimately even with *pleuro-pneumonia*. I have met with several instances of these complications in the course of my practice, and in most of them complete recovery has taken place. The association of general peritonitis with pleuritis of one or even of both sides, is frequent in puerperal peritonitis, particularly as occurring in lying-in hospitals, especially if the disease be not arrested at an early stage. (See PUERPERAL DISEASES.)

79. *b.* Tubercular peritonitis in children is sometimes complicated with *tubercles in the membranes of the brain*, with softening of the central parts of the brain, and with serous effusion into the ventricles, or *acute hydrocephalus*. In these cases, of which I have seen several, the lesions of

the peritoneum and of the brain and its membranes, were consequences of inflammation in connection with tubercular productions, in scrofulous constitutions.

80. VI. Appearances on Dissection.—i. After Acute Peritonitis.—The changes produced by acute inflammation of the peritoneum vary with the severity or activity of the disease; with the habit of body and constitution of the patient; and with the predisposing and exciting causes; they differ most essentially according as the disease presents *sthenic* or *asthenic* characters (§§ 8. 26.), as it occurs *primarily* or *consecutively*, and as it has been preceded by, or is associated with, depression of vital power, or contamination of the circulating fluids. I shall therefore describe, 1st, those changes which are observed in the more *sthenic forms* of the malady—or those affecting persons whose vital powers are not exhausted, and whose circulating fluids are uncontaminated; and 2d, those alterations observed in *asthenic states* of the disease; reserving, however, a more detailed account of these latter, until they come under consideration in the article on Puerperal Diseases.

81. *A. After acute sthenic peritonitis.—a. The earliest change* in acute peritonitis is a loss of the polish of the free surface of the membrane, which assumes a dull, opaque, and occasionally a dry-like appearance. Red vessels are seen, either grouped in spots, forming a number of puncta, or in streaks. The surface, appearing dull or even dry, is upon a closer examination found to be covered by a most delicate, unctuous, and slightly viscid exudation. The dense cellular tissue connecting the peritoneum to the parts underneath, or at least the attached part of the membrane, is the situation in which the increased vascularity seems to commence. Even at this stage, the former is somewhat infiltrated with an albuminous serum, giving the subserous tissue a thickened aspect, in which the membrane itself appears to participate. The peritoneum may be detached from the parts it covers with greater facility than in the healthy state, owing to diminished cohesion, and infiltration of the inflamed subserous tissue. As yet the minute capillaries, forming puncta, or streaks, or assuming a reticulated appearance, interspersed with red points or spots, consist of the colourless vessels of the membrane enlarged so as to admit the red globules; but, as the disease advances, the vessels appear more and more superficially. The small spots become more extended, approach each other, and at last coalesce, so as to form patches of various dimensions. The membrane itself is not, as yet, materially thickened, beyond the slight degree just noticed, produced chiefly by the change in the subjacent cellular tissue and its adhering surface. The redness now becomes more intense, deep, and extended. This may be considered as the *first stage* of the changes caused by acute inflammation, and is attended by intense pain, tenderness on pressure of adjoining parts, a quick hard pulse, and symptomatic fever. It seldom exceeds three days, and sometimes does not endure twenty-four hours until further lesions supervene.

82. *b.* The most remarkable of these lesions is the *exudation of lymph* on the inner or unattached surface of the membrane. This is effused in a fluid state, and at first is an increased exudation of the viscid matter already noticed as giving a dull and an opaque appearance to the membrane. This exudation becomes more copious, especially as the surface is more crowded by capillaries injected with red blood. It is generally of a straw-colour, homogeneous, gelatinous, semitransparent and coagulable, gluing together as it were, in a slight degree, those free surfaces of the inflamed membrane which come in contact. Sometimes the reddened colour of the surface is heightened by the exudation being red and sanguineous, and adhering closely to it, giving it a villous appearance. Sometimes the exudation is of whitish or whitish-grey colour. With the exudation of lymph, the redness becomes more extended; in some it is nearly limited to the parts covered by, and to those slightly adherent to the opposite surface through the medium of, this exudation. In other cases the redness extends, in a somewhat less degree, in bands or stripes, along the surfaces between the parts covered by this exudation; these intermediate surfaces being either nearly dry or apparently so, and as yet not advanced to the stage of effusion. As the exudation proceeds in the more acute cases, it becomes more abundant, and varies in quantity and density, according to the activity and duration of the disease, and constitutional energy of the patient. It constitutes the *coagulable lymph* of Hunter and other British pathologists, and the *albuminous exudation* of Continental authors, from the large proportion of albumen which enters into its composition.

83. When this substance is minutely examined about the fifth or sixth day of the disease, or about the third from the commencement of its formation, it is generally of a pulpy consistence, partially translucent, of a straw yellow or greyish colour, and, when torn asunder, presents a cellular or cellulo-filamentous structure in its denser parts, from which more or less serous fluid escapes. Seperated from the membrane on which it has been formed, its adherent surface is rough, irregular, minutely honey-combed, and marked by more or less numerous minute dots of blood, arising from the disruption of the recently formed capillaries passing from the inflamed serous surface into the new product. Here we have the most complete example of the formative process being one of the characters of inflammation occurring in persons of a previously healthy state of system.

84. *c.* This exudation, which is fluid when first poured out, and has rapidly assumed the state now described, experiences further changes during the continuance of life. These, however, vary with the different states of the disease and circumstances of the case. One of the most constant, is the agglutination of the opposing surfaces of the inflamed membrane. To occasion this, it is not necessary that both the opposing surfaces shall have been previouly inflamed; for, the lymph effused from the primarily inflamed surface, coming in contact with a circumscribed portion of the opposite surface, irritates and inflames it only, and thus increases the quantity of the effused lymph, which becomes a connecting medium between the inflamed surfaces; capillaries, carrying red blood, passing from both surfaces into the effused lymph, so as to change and organise the substance still further. In cases of this kind, the portions of the peritoneum intermediate between

the parts, whose secretion has been thus effected, have frequently presented little or no appearance of inflammation; or have been moistened only by a small quantity of a sero-albuminous fluid, or have contained a larger quantity of a similar effusion.

85. *d.* The *connection* or *adhesion* thus formed between the opposite points or surfaces of the peritoneum, varies much in its characters with the period which has elapsed since the effusion of the lymph which produced it, and with the surfaces which it exists between. At first the exudation is fluid; but it soon coagulates into a gelatinous, pulpy substance, of various density, exhibiting a weak cellulo-filamentous structure, enclosing in its meshes the serous parts of it, and easily separated from the surfaces it either covers or connects. After a time its cellulo-filamentous structure becomes more firm, and is penetrated by minute capillary vessels, shooting into it from the inflamed membrane, to which it is now more strongly attached by means of the vessels passing into it. The process of organisation of the plasma or effused lymph has now commenced; and it proceeds more or less rapidly. The vessels penetrating the newly-formed substance are now more numerous, so as to admit of injection in fatal cases; its cellulo-filamentous structure becomes firmer, more opaque, and somewhat whiter; it is firmly attached to the serous surfaces, which it connects more or less closely, and the serous portions of the exuded lymph contained between the meshes or cellules of the cellulo-filamentous structure, are absorbed. This substance is now nearly altogether albuminous; and, as the inflammation which produced it declines, the vessels penetrating it contract, so as ultimately to convey only the colourless portion of the blood. This contraction of the vessels, after the decline of the inflammation which formed them, is also accompanied by a great reduction of the bulk of the newly-formed substance; if not to its entire removal, especially when the inflammation and the albuminous exudation are limited, recovery from the attack taking place.

86. *e.* In less acute, or rather sub-acute or partial forms of peritonitis, or when the more acute symptoms have been subdued, and where inflammation has existed from fifteen to thirty-five days or even longer, before producing death, the albuminous exudation forms false membranes of a greyish, whitish, or even reddish colour, establishing adhesions between contiguous parts, and varying in thickness from half a line to three lines, generally in proportion to the duration of the disease. When detached from the serous surfaces which produced them, and to which they adhere firmly, these surfaces are found much inflamed, and sometimes dotted with minute specks of blood, owing to the rupture of the connecting capillaries. The false membrane itself is here found firm and elastic, and not pulpy and friable, as in the most acute cases, or in those which have more rapidly terminated in death. In these cases, little or no effused fluid is observed, that which may have been poured out with the albuminous formation during the earlier period of the inflammation having been absorbed.

87. According to the violence of the inflammation, to the duration of it, and to the constitution of the patient, sthenic acute peritonitis may give rise to *false membranes*, *membranous adhesions*, *cellular adhesions*, or *cellular bands*; and these may be the chief or only changes produced, beyond the increased vascularity of the membrane underneath. But, in many cases other changes supervene. The chief of these concern the morbid productions themselves, the nature and character of the fluids effused, in connection with these productions; and the state of the membrane itself and of the subjacent cellular tissue.

88. *f.* Where the *false formations* are considerable, and have assumed an *organised and cellular structure*, the vessels proceeding to them are very minutely divided when they have reached the peritoneal surface, and are about to pass into the morbid production; but, having passed into it, they again unite and form larger vessels, which ramify in different directions through this production. This distribution has led some pathologists to suppose that these vessels are first formed in the morbid productions, as in the envelope of the vitellus of the incubated egg; but this is not the case, as is shown by the manner in which the capillaries shoot from the inflamed membrane into the lymph thrown out upon its surface (§§ 83, 84.).

89. The morbid formations become firmer and less vascular, after they have been organised, as the period from their production is prolonged (§ 85.). They also become thinner as they grow older, and their surface assumes the appearance of a serous membrane, whilst their internal structure is more strictly cellular. When bands of adhesion stretch from one surface to the other, or when laminated productions extend over a large superficies, or connect opposite parts, they are cellular in the centres and serous on their unattached surfaces; and, at all the points of adhesion with the peritoneum, this membrane has lost its serous characters, the sub-serous cellular tissue being continuous with that which forms the centre of these bands, false membranes, or adhesions.

90. The progressive diminution of the volume of those productions with the subsidence of the inflammatory action which produced them, and with the lapse of time, as well as the history of cases, in which there has been sufficient reason to believe that those productions had been actually formed, have led several pathologists to infer that they may be removed altogether. M. VILLERMÉ was the first to contend, that the adhesions formed between the surfaces of different organs sometimes separate after a time at their centres, and disappear, and the observations of DUPUYTREN, BÉCLARD, and GENDRIN, confirm this inference. I have had reason in the course of practice to concur with this opinion, the justness of which is of practical importance, and should not be forgotten in our management of diseases in which the serous surfaces are implicated; and I further believe, that the diminution and ultimate disappearance of these productions are remarkably favoured by whatever promotes the vital powers, and favours the healthy performance of the several functions.

91. *g.* In acute and sub-acute peritonitis, a *fluid effusion* is either a concomitant or a consequence of the albuminous formation, or both. In cases of partial peritonitis it is most frequently the consequence, particularly of adhesions. In slight and more chronic cases, however, the effusion

of a serous or sero-albuminous fluid is often the principal phenomenon. In the more acute cases, the liquid effusion is whitish-grey, or of a whey or milky appearance. In some it is unctuous, thick, or abounding in albuminous flocculi, of a whitish, yellowish, or lemon colour. In others, it is turbid, greenish, or brownish-red, containing lighter-coloured flakes; but this effusion occurs more frequently in acute asthenic peritonitis; the colour proceeding from a slight admixture of the colouring matter of the blood. In the most acute cases of the sthenic disease, the effusion of much fluid seldom occurs until the powers of life are much exhausted, or until the extreme capillaries and pores have lost their tone; congestion of the venous capillaries either supervening or having already taken place.

92. In many cases, particularly in partial peritonitis, the adhesions, in their advanced or old states, are causes of irritation to the surfaces they connect, either exciting an increased exhalation from the adjoining unattached portions, or being themselves the seat of exhalation; the spaces between the adhesions becoming filled with fluid, either of a serous, a sero-albuminous or sero-purulent character, according to the degree of morbid action in the part and the state of the system. This accumulation of fluid in the spaces between the adhesions, or in cavities the parietes of which are lined with an albuminous exudation in the form of a false membrane, is often owing either to a slight return or exacerbation of the inflammatory action after it had subsided to some extent, or to its continuance in a less severe or chronic form, after the more acute stage had been mitigated. But, in either case, congestion of the venous capillaries, and impaired tone of the affected vessels and tissues, are more or less concerned in the production of the fluid effusion. When the accumulation is large, it constitutes a species of *acute dropsy*, and is dependent upon the same pathological states of the containing membrane and surrounding parts as have been explained when treating of the origin and nature of dropsical effusions.

93. The effusions of congulable lymph, and the consequent adhesions, are remarkable chiefly between the various convolutions of intestines, between the prominent points of these and the omentum, in the pelvic and iliac regions, and between the serous surface of the bowels or of the other abdominal viscera and the peritoneum lining the parietes of the abdomen. In some, the greater number of the folds of the intestines are agglutinated together, and these partially cemented to the omentum, or to adjoining viscera or surfaces, by means of an opaque lymph, of a lemon-yellow colour and pulpy consistence. In others, the agglutination is more partial, and the omentum is shrunk or contracted, and drawn up to the arch of the colon. In some of the most acute and violent cases, the surface assumes a purplish-red or violet colour; and in these the intestines are often united to each other, or to the opposite surfaces, without the intervention of a false membrane, beyond a very thin film of a whitish or greyish albumen.

94. In cases of partial peritonitis, when the disease has been of longer duration, or when the patient has recovered, adhesions more or less extensive, or bands of various dimensions, are often formed between various parts of the opposite surfaces, or between the omentum and one or more of the convolutions of the intestines, between the margin of the omentum and fundus of the uterus, or between other parts, according to the particular seat and circumstances of the partial peritonitis of which these adhesions were the consequences. These albuminous exudations and adhesions present other forms, especially in sub-acute and chronic cases, and are often attended by more or less fluid effusion of a similar description to that now noticed.

95. The *peritoneum itself* is often variously changed, besides being injected in the manner already noticed; and generally the change implicates more or less the subserous tissue: indeed this latter seems often more particularly altered, being œdematous, or infiltrated by coagulable lymph in some cases, and softened in others. In these, the peritoneum is frequently also more or less softened, or more readily torn, and somewhat thickened. In the most acute cases, this membrane becomes in places of a deep brownish red or purple colour, or even almost black; but it very rarely advances to *gangrene*, unless in partial peritonitis caused by strangulated hernia, or by inflammation of the appendix of the cæcum, and then this lesion is limited to the part thus circumstanced, and the peritoneum only participates with the other tissues in the change. M. Scoutetten remarks, that he has met with black gangrenous eschars of a small size, and never exceeding one or two inches in extent. These, however, occur chiefly in the asthenic form of peritonitis, and even rarely in it, as death generally takes place before gangrene can supervene; and in those cases where it is observed on dissection, it is most probably a *post-mortem* change, or at least very shortly antecedent to or concomitant with dissolution.

96. The changes just described, particularly as respects the membrane itself and its false productions and adhesions, are often *partial* or limited; and when this obtains, they are observed more frequently in the peritoneum lining the pelvic viscera, the cæcum, and appendix; and next most frequently in parts of that reflected over the large and small intestines, the liver, diaphragm, and either surface of the omentum; and less frequently in the transverse meso-colon and mesentery; that covering the stomach being most exempt from them.

97. *B. The lesions consequent upon asthenic peritonitis* differ materially from those caused by the sthenic form of the disease. Whilst, in the latter, they are more frequently partial or limited, in the former, they are more general or at least extended; whilst, also, in the sthenic disease, albuminous lymph, false membranes, and adhesions are frequently the chief or only changes, in the asthenic these are very rarely observed, or in a very imperfect and unorganised and unorganisable form. In some cases, a thin muco-albuminous or soft and dark-coloured film is found extending over the surface of the inflamed membrane; and a large quantity of a turbid serum, of every shade of colour, from a whitish or greyish hue to a brownish dark sanguineous or sanious appearance, is effused in the peritoneal cavity. This fluid varies in quantity from a few ounces to several pounds; but it is very rarely above this amount in the acute form

of the disease. It seldom contains the large flocculi or masses of coagulated lymph or albumen sometimes met with in the more sthenic form of the malady, unless in those cases which approach more or less to that character.

98. The peritoneum often presents a softened or sodden and somewhat thickened appearance, in which the subjacent cellular tissue participates. It is generally more readily torn; and, in some cases, I have found this greater lacerability very remarkable, particularly when there was much dark discolouration of the surface, which is more or less altered in colour, being commonly of a dark, brownish, greyish brown, or purplish tint, the shades varying in different situations. Various other appearances are often observed in this membrane, in the viscera over which it is reflected, and in the fluids effused into its cavity; but, as these most frequently occur in the puerperal states of peritonitis, they are described in the article PUERPERAL DISEASES.

99. ii. LESIONS CAUSED BY CHRONIC PERITONITIS. — When the peritoneum has been chronically inflamed, the lesions which present themselves are very various, according to the constitution of the patient, and the duration of the disease. But they differ also most remarkably according as they proceed from an inflammation which has become chronic, consecutively upon an acute form of the disease, and as they result from a slow, insidious, almost latent, and primary state of inflammatory irritation or action, — according as they are *consecutive* or *primary*. They differ, moreover, as the peritonitis is simple or associated — as it is *non-tubercular* or *tubercular*.

100. *A. The changes which follow chronic peritonitis consequent upon the acute* vary with the duration and circumstances of the case. — *a.* In some, after the duration of fifty or sixty days, the peritoneal cavity is filled with a considerable quantity of a whitish serum, occasionally resembling partially curdled milk. Numerous bands of adhesion and portions of false membrane presenting the same appearances, and formed as above (§§ 81. *et seq.*) described, unite the greater part of the intestines to each other, or line the intestinal peritoneum and omentum. These false membranes often form partial sacs, containing a fluid, the characters of which are various. When the false membrane is detached, the portion of the peritoneum underneath has not so red or so vascular an appearance as in the acute disease; sometimes, indeed, it is hardly coloured. In many of these cases, the quantity of fluid effusion is inconsiderable, and the false membranes are less extensive and thinner; opposite surfaces being united by adhesions or bands, and not by continuous albuminous layers.

101. *b.* In some subjects, a considerable quantity of a yellowish limpid serum, without clots or flocculi, is found in the peritoneal cavity, about this period of the disease, but without any trace of false membrane or adhesion; the peritoneum being, however, reddened, thickened, and injected. The omentum, in these, is very much thickened, red, and fleshy; and sometimes contains small vesicles or cysts.

102. *c.* In other cases, and particularly at a later period of the disease, the abdomen is distended by the accumulation of serum. The intestines are pushed towards the vertebral column, and sometimes adhere slightly, or more or less extensively, to each other. The peritoneum is generally thickened and papillous, having a greyish lardaceous appearance, occasionally with bloody striæ and red spots, seemingly formed by slight extravasations of blood. In some of these cases, furrows or broad superficial erosions are formed in the thickened peritoneum. The fluid collected is occasionally clear and yellowish; in some it is turbid, greyish, brownish, or even sanguineous, particularly where the bloody striæ or spots are observed in the thickened membrane. In rare instances *hæmorrhage* has occurred, owing to the destruction of small vessels by the superficial erosions just mentioned. These erosions in rare instances become more and more deep, and are converted into *ulcers*, which destroy the membrane and advance to the subjacent tissues, forming the primary peritonitic ulcers of SCOUTETTEN.

103. *d. Gangrene* very rarely is observed in chronic peritonitis; and only when a recurrence of the acute disease takes place, or when acute inflammation attacks the subjacent structures; and then only limited portions of the membrane are implicated. In these, eschars of a greyish slate or dark colour are formed, their surfaces being covered by a dirty, greyish matter. The eschars in these instances generally extend to the subjacent tissues.

104. *B. The lesions consequent upon primary non-tubercular peritonitis* are, in some instances, not very different from the foregoing, in others, they differ materially. — *a.* Very slight *redness* of the peritoneum is often observed, and as frequently this is entirely wanting. When it occurs, it is usually of a brownish shade. If more remarkable, or of a brighter tint, it is then owing to an acute state of inflammation, which had supervened upon the chronic, and terminated life; but in these cases other marks of acute action are often found united to the characteristic alterations of the chronic.

105. *b. Thickening* with increase of density is one of the chief changes observed in the primary form of chronic peritonitis. The thickening is owing not only to increase of the membrane itself, that being seldom very great, but also to infiltration and tumefaction of the subjacent cellular tissue, identifying it completely with the serous coat in such a manner, that it is impossible to distinguish the exact limits of this membrane, particularly in very chronic cases. The difficulty is also much increased by the organised false membranes, often formed upon the peritoneum, and which become ultimately identified with it, in such a manner as themselves to become inflamed and to give rise to similar productions.

106. *c.* The increase of *density* of the chronically inflamed peritoneum is usually considerable, so that it is generally torn with greater difficulty than in the healthy state, or especially after acute inflammation. It is detached also with much more difficulty from the subjacent parts, owing to the increased density of the connecting cellular tissue; and is much less friable than in the acutely inflamed state.

107. *d.* The surface of the membrane is rugose, dull, and presents a number of small elevations, which are perceptible to the touch as well as to the sight, are whitish, somewhat flattened, and irregularly intermixed with brownish

specks: these specks resemble those which are observed in acute inflammations, and occasion no elevation of the surface. These small elevations, although generally observed on the surfaces of the thickened membrane, are not confined to these surfaces, being frequently also found on false membranes; they are usually called *granulations*. Some have confounded them with the tubercles which sometimes are developed, either under the inflamed peritoneum, or in its substance, or in the false membranes. They may, however, be distinguished from these latter, by the following marks: the small whitish, flattened granulations arise upon an exhaling surface, and seem to elevate an epidermis whiter and more opaque than the serous texture itself, indicating that they exist in the substance of this membrane. Around them there is always observed a slight vascular injection, very evident under the microscope, and sometimes apparent to the unassisted eye. Upon dividing the membrane, a minute infiltration of whitish serum is observed at the points where the granulations have been divided, with a slight increase of thickness of the parts of the membrane where they are developed. They are not enclosed in any cyst, but are mere infiltrations into the structure of the part in which they are formed, as first shown and contended for by me in a memoir on chronic peritonitis, published in 1821 (see *Lond. Med. Repos.* vol. xvi.), and since confirmed by M. GENDRIN and others.

108. *e.* The false membranes found in this state of peritonitis are completely organised and dense. Occasionally they are indurated, of a fibrous or lardaceous structure: in other cases they are entirely wanting, and it is in these latter that the thickening of the peritoneum has taken place, chiefly in the direction or at the expense of the subjacent cellular tissue; the free surface of the membrane appearing as a rugose epidermis of a dull greyish-white colour, elevated by numerous granulations, and spread over a thickened and indurated coat of the connecting cellular tissue. In other, but rarer cases, the peritoneal cavity is nearly obliterated by dense false membrane, indurated or cellular in parts, or united to the opposite surfaces by large bands; or then by one mass of indurated cellular tissue, having its areolæ filled with a gelatinous substance. In some instances, the false productions consist of several layers, of different degrees of thickness and density. They are not always, as M. GENDRIN has shown, closely adherent to the subjacent peritoneum, being sometimes separated from it either by an effused fluid, or then by more recently effused lymph, owing probably to an acute action having taken place shortly before death.

109. *f.* In a few cases, the peritoneum presents a brownish, or very dark colour, is less dense and coherent than usual, and is infiltrated, particularly in parts, by a dark-coloured blood. At first sight the membrane seems to be gangrenous, but, on examination, it is not disorganised, its surface being rugose, granulated, and sometimes elevated by small ecchymoses or clots of dark blood, effused under its surface or in its substance. This change is observed only in persons of a cachectic, scorbutic, or broken-down constitution. M. GENDRIN views this alteration as a complication of hæmorrhagic congestion with chronic inflammation. Occasionally it is accompanied with an exhalation of bloody serum into the cavity; and very rarely with a puriform exudation on the surface. In this latter case, it may be presumed that a subacute state of inflammatory action had taken place shortly before death.

110. *g.* If acute inflammation have supervened upon the chronic, and continued for some days, it may produce not only albuminous formations, but also vascular injection of the part of the peritoneum thus affected. This injection may be either punctated, striated, or even general; and in this last case, the surface of the membrane is sometimes lined with a puriform or perfectly purulent matter.

111. *C. Tubercular chronic peritonitis*, although generally assuming a chronic character, does not always commence as such; and, even when it is primarily chronic, as it is most frequently, it may pass into the acute, at least in a partial or limited manner.—*a.* At an early stage of the disease, coagulated lymph, in the form of a soft false membrane of a greyish yellow colour, and amorphous, is thrown out upon the inflamed surface. The organisation of this substance soon commences, but in a morbid state; small whitish grains soon appear in this hitherto amorphous production, which presents a few rudimental vessels. These grains are diaphanous, more dense than the coagulated lymph containing or surrounding them, and from which they are readily separable. When viewed by the microscope, they are seen surrounded by a vascular net. The false membrane forms adhesions to the peritoneal surface, that are more intimate where these small grains or concretions, the commencing tubercles, are most numerous. These adhesions soon become very intimate, the false membrane more vascular and more organised; and the inflammation, if of an acute character, passes into the chronic state; and the serous surface, and the false membrane covering it, are still more intimately united, so as to form apparently but one very thick coat, in the substance of which the tubercles are developed and adherent. This membrane is often very vascular, the capillary vessels passing into it being often very large; the tubercles acquiring considerable size, and being much larger than the granulations above described (§ 107.). The tubercles do not exist, as is the case with the latter, in the substance of the peritoneum, but are formed within the false productions and at the same time with them; whilst the granulations are found only after these productions are fully formed, when seen on the surface of them, and in consequence of their inflammation.

112. *b.* Although tubercles cannot be said to exist in the peritoneum itself, yet they are often found in the sub-peritoneal cellular tissue, and are to be distinguished in this situation, as well as in false productions or membranes, by their being always encysted; the tunic or cyst arising from the condensation of the cellular tissue in which the tubercular matter is effused. When these tubercles form in the mesenteric or omental subserous tissue, they often reach a larger size than when they occur in the subserous tissue of the intestines, and are much more numerous. Dr. HODGKIN remarks, that in the latter situation they appear as if the part were sprinkled with particles of rice. They are often surrounded by a vascular areola, the tint of which varies with the

colour of the blood injecting the capillaries forming the areola, and are readily distinguished from the miliary granulations found in the peritoneum itself, in the manner above noticed (§ 107.)

113. *c.* Chronic tubercular peritonitis is often associated with *ulceration* and *perforation* of the intestines, sometimes so extensive, as I have occasionally observed, particularly in children, as to form direct fistulous communications between distinct but contiguous convolutions. These communications may arise from primary ulceration of the mucous coat, advancing to the peritoneal, and producing consecutive partial or more general peritonitis, of a sub-acute or chronic form, independently of tubercular formations; but they are more frequently attended by these formations, and then it is doubtful, at least in some cases, whether the ulceration has commenced and proceeded in this way, or has originated in the situation of the tubercles, which, being softened, are followed by ulceration and perforation of the bowel, from without inwards. Dr. HODGKIN remarks that puriform collections, varying from the size of a pea to that of an orange, sometimes form in those situations in which the exudation of concrete lymph is greatest, as in the angular and lateral parts of the abdomen,—and that these collections are often attended by ulcerative absorption of those points of the peritoneum in contact with them, the ulceration extending to the subjacent coats, until a communication between these collections and the canal of the bowels is effected. The ulcerations thus consequent — 1st, upon softened tubercles, formed either in the plastic lymph, or beneath the peritoneum; and 2d, upon the purulent collections just mentioned, may, severally, give rise to communications not only between different parts of the bowels, but even between the intestine and the external surface, thereby producing artificial anus.

114. *D.* After this, as well as after the preceding form of chronic peritonitis, the peritoneal cavity frequently contains more or less *fluid*, which is usually opaque, of a whitish yellow colour, sometimes milky, and occasionally of an unpleasant or even foetid odour, particularly when this membrane has been long inflamed.—*a.* In a few cases, the fluid partly consists of a mucopuriform matter, whitish, of the appearance of a semi-concrete albumen, mixed with pus; in others it is nearly puriform, but much more frequently it is limpid, or it resembles clear whey. In very rare instances it is gelatinous, with a thicker gelatinous or slimy coating over all the inflamed surface. The quantity of fluid effused is variable: sometimes it is so great as to distend the abdomen; when in smaller quantity, the cavity is partly filled with false membranous productions of a cellular texture, occasionally infiltrated with pus. In a few of these cases the inflamed cavity has its capacity somewhat diminished by a sinking inwards of its parietes, an alteration observed after the disease had appeared to tend towards recovery.

115. *b.* In those cases attended by liquid effusion into the peritoneal cavity, the *omentum* is contracted or corrugated under the greater curvature of the stomach, and often reduced to a small size. If, however, an old adhesion have taken place between some part of it and an adjoining surface, the omentum is usually found extended in the form of a chord between the stomach and the part at which the adhesion exists.

116. *E.* Dr. HODGKIN remarks, that in chronic peritonitis the *mesentery* is found more or less shortened, by which the intestines are drawn up to the spine; and if a hernia had existed, it will sometimes be found completely reduced. The *intestines* are reduced more frequently in their length than in their calibre. "In extreme cases," he adds, "they probably lose nearly or quite half their dimensions, and the valvulæ conniventes are consequently placed close to each other. This contraction of the omentum, mesentery, and intestinal canal seems to depend on the contractions which newly-formed parts undergo after they have become organised or permanent, as in the large cicatrices of extensive burns." This shrinking evidently depends upon the false membranes covering the peritoneum, and partly upon the deposit on the attached surface. The original structures also are probably themselves reduced by absorption; partly under the influence of the contraction of the adventitious deposit, and partly under the pressure of the fluid effusion. These contractions were first noticed and explained by Dr. HODGKIN, in his work on "*the Pathology of Serous Membranes,*" (p. 152.)

117. *F. Cartilaginous or semi-cartilaginous induration and thickening* are sometimes met with in parts of the peritoneum in consequence of chronic inflammation. This change is much more rarely seen in this membrane than in the pleura; but it has been remarked by SANDIFORT, PORTAL, CRUVEILHIER, and others. I have met with this change, twice in that portion of the peritoneum investing the spleen, and once in that covering one of the ovaries, — the situations, I believe, where this change is most frequently observed.

118. *G. Ossification of, and ossific deposits in,* the peritoneum, have been noticed by authors, particularly in the omentum, sometimes in connection with osseous, calcareous, or cartilaginous tumours. Most of these instances are not strictly referable to the peritoneum, this membrane being only consecutively implicated. Others are probably only cases of calcareous deposits under the peritoneum resulting from ultimate changes in tubercular matter in that situation.

119. *H. Gaseous fluids* are sometimes found in the peritoneum, generally in connection with the effusion of serum, and with one or more of the other lesions already described. The question as to their source has been often agitated; but I agree with BAILLIE, HODGKIN, and others, that although the peritoneum may in a state of disease secrete a gaseous fluid, yet that most generally this fluid is the result of cadaveric change, when found in this situation. But there still remains another question, May not the gaseous fluid be evolved during the life of the patient from the changes in, or partial decomposition of, the products of inflammation lodged in the peritoneal cavity? This result is by no means improbable, when the quantity, the nature, and the physical condition of the effused fluids are considered; and when the inefficiency of the vital influence in this disease to prevent those changes, to which these fluids are prone, is taken into the account. My experience of this disease, particularly in its asthenic forms, and in the puerperal state, leads me to infer that the effused fluids actually undergo, in the peritoneal cavity,

during the life of the patient, and at an advanced stage of the malady, such changes, or such partial decomposition, as produce gaseous fluids, which aggravate the symptoms, and which, by their partial absorption, contaminate the blood. Many years ago I contended that this is the principal source of the gaseous fluids sometimes found in the peritoneum and pleura in connection with the products of inflammation; and the opinion is now entertained by several pathologists.

120. VII. DIAGNOSIS. The *diagnosis* of peritonitis is often extremely difficult, particularly the partial and chronic states of it. Partial peritonitis, whether acute or chronic, is so frequently consequent upon, and associated with, inflammation of the organ or organs which the inflamed peritoneum invests, that it is often difficult to form a correct idea as to the part affected, either solely or principally. Still the history of the case, in connection with its causes and the early symptoms; and the grouping of the existing symptoms especially characteristic of peritonitis, particularly the abdominal pain, tenderness, swelling, and tension; the position and aspect of the patient; and the states of the pulse, stomach, and bowels, when duly weighed, will generally guide the physician to a correct conclusion. Even in those cases which are consecutive of inflammation of the enclosed viscus, and which are strictly partial, the characteristic phenomena of peritonitis are usually present, although more or less limited to the situation affected. These are the acute, burning, or sharp pain, swelling, tenderness, and tension; the position best calculated to take off pressure from the seat of disease; the sharp and anxious countenance; the quick, sharp, hard, constricted or small pulse; the short, small, frequent and thoracic respiration; the dread of coughing, sneezing, or of a full respiration; the retchings, vomitings, or flatulent eructations; and the symptomatic fever, in various grades of severity, according to the intensity and extent of the inflammation, whether partial or general; the chief difference being in the limitation or extension of the local symptoms.

121. When inflammation of one or more of the abdominal viscera is followed or attended by these symptoms, the inference, that the peritoneum investing them is implicated, or has become chiefly affected, will generally be correct; and, if these symptoms appear primarily, without any marked functional lesion having preceded them of the organs invested by the peritoneum, to which the symptoms are limited, it may safely be inferred that the peritoneum of that region is primarily and principally attacked; and the treatment should be directed conformably with this conclusion. — The diseases for which peritonitis is most liable to be mistaken are, enteritis, gastritis, colic, rheumatism of the abdominal muscles, neuralgic and hysterical pains in the abdomen, &c. Of all these the diagnosis between enteritis and peritonitis is the most difficult.

122. *A. Enteritis* is with great difficulty distinguished from peritonitis; and, in many cases, the diagnosis can hardly be made, especially in that state of enteritis where the peritoneal covering of the small intestines is chiefly affected. (See art. INTESTINES, §§ 31. 69. 74.). CULLEN, WILSON PHILIP, and others, have insisted upon the difficulty of the diagnosis in these cases; and when the peritonitis is limited to the serous covering of the intestines, or has commenced in this situation, it is certainly and necessarily very great; for the disease is in truth a partial peritonitis becoming more and more extensive. Many of the diagnostic symptoms so strongly insisted upon by authors, who have copied their descriptions of disease from those who have written before them, instead of writing from their own observation, either are fallacious or occur only in certain circumstances. Thus the greater sensibility or tenderness of the abdomen, and the more acute pain, said to distinguish peritonitis from enteritis, cannot be depended upon, for these will depend, in either case, upon the susceptibility and sensibility of the patient and the intensity of the disease. Neither can the states of the bowels be always viewed as offering any indication of importance. The confidence, indeed, with which diagnostic symptoms has been advanced by some recent writers tends more to mislead than to instruct the inexperienced. After long experience and tolerably close observation, I may remark, that all diagnostic symptoms, particularly between these diseases, should be cautiously estimated; and although it may not be of much importance as respects the treatment, whether or not the one malady be distinguished from the other, still something may be gained, in this regard, as well as respects the prognosis, by a greater precision of information.

123. In the more general states of peritonitis the diagnosis is often not so difficult as in those just adverted to, or when the intestinal peritoneum is inflamed. Here there are often observed, although not always, greater and more general, and more superficial pain of a burning or acute kind; greater sensibility to pressure; more remarkable swelling and tension of the abdomen; less tolerance of motion of the body and of the abdominal muscles; a greater dread of coughing, sneezing, and of a full respiration; and less motion of the diaphragm, than in enteritis. Vomitings or retchings are generally not so early nor so frequent in peritonitis as in enteritis; although often equally so in an advanced stage of the former; but in many instances they are not very urgent until the disease is verging towards a fatal termination. The bowels are usually constipated in both maladies unless in the more asthenic states of peritonitis, when they are sometimes even relaxed, especially in the low infectious form of puerperal peritonitis.

124. *B.* The other diseases which are said sometimes to simulate peritonitis can hardly be confounded with it, if due attention be paid to the symptoms. — *a. Gastritis* will not be mistaken for it, if the abdomen be carefully examined; for the seat of pain, the desire of cold fluids, the thirst, and early vomitings, always following the ingestion of fluids, will generally indicate the affection of the stomach. If the peritoneal coat of this viscus is inflamed, the disease may be considered either as a form of gastritis, or as partial peritonitis, according to the views of the physician; but this portion of the peritoneum is the most rarely affected, at least alone, and in this climate. Some aid may occasionally be afforded in this case, as well as in others, by *auscultation;* for, although the motions of the diaphragm are generally slight, yet sometimes an imperfect or obscure rubbing

sound is heard, with the respiratory movements, in the sthenic forms of peritonitis; and when much affusion takes place, and *percussion* is tolerated, a dull sound is emitted where the affusion is considerable. These modes of examination may assist in distinguishing peritonitis from the diseases just noticed as well as from colic, and some other maladies.

125. *b.* Certain states of *colic* sometimes resemble peritonitis, especially when the former is attended by much abdominal distension and pain; for I have seen in some instances the tenderness on pressure so great, owing to the stretching of the peritoneal covering of the bowels by the flatus distending them, as to resemble peritonitis. In these, the absence of fever, the state of the pulse, the cool or natural temperature of the abdomen, and other concomitant symptoms, will guide the physician. Still the occasional supervention of peritonitis or enteritis in these cases should be kept in recollection. In the more common states of colic, when pressure is tolerated, or even gives ease, there can be no mistake as to the nature of the disorder. (See art. COLIC.)

126. *c.* An *hysterical form of colic*, and a *hysterical state of neuralgia*, may somewhat resemble peritonitis, chiefly owing to the apparent tenderness of the abdomen, which, however, is tolerant of firm pressure unexpectedly made on it. In these cases, the presence of other hysterical symptoms, the borborygmi, and the flatulent state of the digestive canal; the situation of the pain, and its connection with uterine irritation, and occasionally with tenderness in some portion of the dorsal or lumbar spine; the absence of fever and of several other inflammatory symptoms; the states of the urine and of the catamenia, &c., will generally indicate the nature of the disorder. I have, however, met with cases of hysterical colic, in connection with dysmenorrhœa, where the extreme tenderness, the acute pain and tension, in the lower regions of the abdomen, the retchings and vomiting, and the disturbance of the circulation, induced a dread of inflammation of the portion of the peritoneum reflected over the uterine organs; and most probably the congestion of these organs had so affected the peritoneal covering, either by stretching or injecting it, as to develope its sensibility, the removal of the congestion by the supervention of the discharge, removing also the suffering with the cause.

127. In all cases, when the abdominal tenderness of *hysteria* most closely simulates peritonitis, a remarkable incongruity of symptoms is observed. The states of the countenance, of the pulse, of the tongue, of the evacuations, and of respiration, are inconsistent with peritoneal inflammation. The breathing is hurried and laborious, and not suppressed, short, and shallow as in peritonitis; the pain and tenderness shift, or suddenly appear and as suddenly depart; the catamenia are usually more or less disordered; and leucorrhœa is often present. In the hysterical affection the state of the temper and of the moral feelings, and the frequent occurrence of other hysterical symptoms, often of themselves sufficiently characterise the disorder.

128. *d. Rheumatism* rarely affects the abdominal muscles, but, when it does, it may be mistaken for peritonitis, owing to the intense pain felt on pressure and motion. Dr. PARR states that the pain in rheumatism of these muscles is felt chiefly at their origins and insertions, shooting to the false ribs and spine of the ilium. This, however, does not agree with my observation; for I have considered the sheaths and aponeurosis of the abdominal muscles to be the chief seat of the rheumatic affection in those cases which I have seen. A careful examination of the abdomen, the state of the countenance, and the absence of retchings, and of the chief symptoms characteristic of peritonitis, will readily indicate the nature of the disease. It should, however, be kept in recollection, that acute rheumatism of these muscles may be followed by peritoneal inflammation. Such instances are rare, but I have met with two or three. The pains and girding sensation, or feeling of tension around the abdomen, often attending irritation and inflammatory action in the spinal chord or its membranes can hardly be mistaken for peritonitis, if the least attention be paid to the history and symptoms of the case.

129. VIII. PROGNOSIS.—*A.* At an early period of *acute sthenic peritonitis*, much confidence may be entertained in a favourable result, although considerable danger should be apprehended until the good effects of active and prompt treatment become apparent. If, however, those effects are not manifested soon after the measures have been resorted to, that I am about to advise at an early stage of the malady; if the disease have advanced far before suitable treatment was adopted; if indications of any of the unfavourable terminations mentioned above (§§ 32. *et seq.*) have appeared; and if the case presents the *asthenic* form or a complicated state, an *unfavourable prognosis* should be given; but hopes of recovery should not be entirely relinquished. The prognosis of peritonitis occurring in the *puerperal state* depends upon various circumstances peculiar to this state, and must be considered in connection with PUERPERAL DISEASES.

130. The most *favourable indications* are furnished by the symptoms already enumerated of resolution of the inflammatory action (§ 31.) by a subsidence of all the painful and urgent symptoms. On the other hand, if the symptoms increase in severity, especially after judicious means have been administered; if the heat of the abdomen augment or is more harsh; if the vomiting become more urgent; the pulse more frequent, smaller, irregular, or intermittent; the countenance more anxious and collapsed, or the extremities cold or clammy; if the breathing be very short, interrupted, painful, and attended by distress and restlessness; if singultus supervene with or without meteorismus, or a pumping-up of the contents of the stomach or eructations of fluid matters, and if constipation be obstinate, no hopes of the recovery of the patient should be entertained.

131. The causes of the disease, and the various circumstances and complications attending and characterising particular cases, should be duly estimated before we form or give an opinion as to the result. Thus peritonitis caused by perforation of the stomach or intestines, or that appearing in the advanced course of continued and exanthematous fevers, or following abscess in, or the rupture of, any viscus, rarely or never admits of complete recovery. Peritonitis also following surgical operations involving the peritoneum, and

that caused by or consequent upon, or connected with, erysipelas, is attended by very great danger, particularly in the crowded wards of an hospital, or in an impure atmosphere. Various other circumstances of only casual occurrence will also weigh with the intelligent physician when he forms his prognosis in any case.

132. *B.* The *chronic forms* of peritonitis very rarely admit of recovery in any case which is distinctly characterised. The slighter or even partial states, following the acute, may, however, be removed more or less completely by careful treatment and regimen, especially when affecting persons not far advanced in life and of an otherwise good constitution; but the more general form of primary chronic peritonitis, and still more particularly the tubercular complication of it, should be considered as entirely hopeless, although life may be prolonged for some months.

133. IX. CAUSES.—The causes of peritonitis are many of those which most frequently occasion inflammation of other internal viscera and external parts (see INFLAMMATION, §§ 91—121.); but there are some causes which determine more especially the development of this disease, and which may be more particularly adverted to.—*a.* Many of these *act directly* upon the seat of inflammation, as wounds, operations, bruises, lacerations, ruptures, displacements, strangulations of parts, &c., implicating the peritoneum more or less; great or unusual stretching or distension of this membrane; the passage into its cavity of matters foreign to it, as blood, chyle, bile, fæces, pus, tubercular matter or other morbid secretions, &c.; invaginations of portions of the bowels, or stricture or undue pressure of parts of them or of the omentum by tumours, bands of old adhesion; inordinate and continued pressure by or on surrounding or adjoining parts, and prolonged and unusual exertion of the abdominal muscles, &c.

134. *b.* Other causes *act from contiguity*, as pre-existent disease of some viscus covered by the peritoneum, especially dysentery, diarrhœa, and ulceration of the stomach or bowels; enlargements or tumours of subjacent parts; inflammation of any of the viscera or structures enveloped by this membrane, particularly of the intestines, urinary bladder, uterus, ovaria, liver and spleen; and malignant or other structural lesions of adjoining parts. This class of causes generally occasion partial or limited peritonitis.

135. *c.* Certain causes occasion peritonitis through *the organic* and *vital actions*, and *the circulating fluids*, there being, however, a predisposition in the peritoneum or some part of it to become affected, or pre-existing circumstances determining the inflammatory action to this membrane. Many of the causes just enumerated may be merely determining influences in developing the morbid action in this situation, other causes affecting primarily the vital and circulating functions, and producing the inflammatory diathesis or constitution. Of these latter, the most frequent and influential are, exposure to cold, humidity, or both conjoined, and to currents of cold air; sleeping on the ground or in the open air, or in damp beds or bed-clothes; sitting in wet clothes; the contaminating or infecting influence of foul air, or of animal miasms upon injuries, wounds, &c., communicating either directly or indirectly with the peritoneum; the suppression of accustomed discharges or evacuations, and of determinations of blood from more external parts; the retropulsion of cutaneous eruptions, of rheumatism, erysipelas, &c.; repeated attacks of ague, occasioning vascular determinations to the liver and spleen, and unusual stretching of the investing peritoneum, favouring the supervention of inflammation of it; changes in the state of the blood, as respects both quantity and quality; and the puerperal states, and the various circumstances attending them. (See PUERPERAL DISEASES.)

136. X. TREATMENT.—Having described the several states of local and general morbid action characterising this malady, their varying consequences, and their complications, each of which requires a different or modified plan of treatment, it becomes necessary that the means appropriate to each of them should be fully stated. In every case, however, the treatment ought to be conducted according to its individual features and circumstances; but in all, the measures should not only be efficient, but they should also be promptly employed, and with due reference to the stage and progress of the disease, and the other peculiarities of the case.

137. i. TREATMENT OF ACUTE PERITONITIS.—*A. Acute sthenic peritonitis*, whether partial or general, requires a prompt recourse to measures calculated—1st, to arrest the inflammatory action locally, and the general febrile commotion; 2d, To prevent the most injurious consequences of inflammatory action from supervening; and to remove them, as much as may be possible, if already they have more or less taken place. These objects comprise all the indications, which have been paraded by some writers, and which can rarely be individually followed or even mentally recognised in the course of practice; the intention being to take the shortest and most efficient method of accomplishing these ends. It should always be recollected, when treating this form of the disease, that, although most frequently commencing in a partial or limited form, it may rapidly become more and more extended, sometimes unexpectedly; and that the surest means of preventing this extension are active and prompt measures, relatively to the constitutional powers of the patient.

138. *a. First, To arrest the morbid action*, whether more or less extensive, or of longer or shorter duration, the most antiphlogistic measures are required, and should be energetically employed, particularly in the more violent cases, and during an early stage of the disease, or before indications of much effusion into the peritoneal cavity, or of a very general extension of the disease, present themselves. In these latter circumstances, the powers of life are often too far depressed by the extent and severity of the morbid action,—the constitutional energy has sustained too severe a shock, at least in many instances,—to admit of very active antiphlogistic means, or too copious depletions, especially at such an advanced stage of the disease as these changes characterise. During the earlier periods of this form of the malady, and particularly in young and robust or plethoric persons, *venesection* should be resorted to, in the manner so frequently recommended in this work (see article BLOOD, §§ 64. *et seq.*), and blood taken until a marked impression is made upon the

pulse, but short of fainting, for the reasons elsewhere assigned. Immediately after the depletion, full or even very large doses of *calomel* and *opium*, —from five to fifteen, or even twenty grains of the former, and from one and a half to three or even four of the latter—ought to be given. These will generally have the effect of allaying irritability of the stomach, of equalising the circulation, of procuring perspiration or a relaxation of the skin, and of keeping down the vascular action to the point to which it was brought by the bloodletting.

139. If these effects are not produced in the course of a few hours, and more especially if the pulse still continue hard or constricted, and the abdomen tense and tender, or if the pulse should begin to rise, and the pain to increase or to return, *bloodletting* should be again practised, generally in smaller quantity, and be followed, as before, by a repetition of the calomel and opium, in the same, or in somewhat reduced doses, according to the effects produced by the former. In this disease, and more especially at an early period of it, the physician should not be deterred from bloodletting by the smallness of the pulse; for the pulse will become fuller and softer, and often less frequent, as the depletion proceeds. It may be necessary in some cases to repeat the bloodletting a third time in the manner already recommended, and to follow it by the calomel and opium as before; but in most instances of this form of the malady, this will not be requisite, and in many, where a doubt may exist as to its propriety, leeches may be placed on the abdomen, in numbers according to the severity and other circumstances of the case; and be followed by fomentations, &c., and by calomel and opium, in doses suggested by the quantity and effects of those already taken, and by the period which has elapsed between the exhibition of them.

140. Having carried vascular depletion as far as may prudently be attempted, and having employed calomel and opium as now advised, the disease will be either entirely or partially subdued. If, however, pain, distension, and tenderness of the abdomen still remain,—if the stomach be irritable, and the bowels constipated, the gums or tongue indicating no incipient mercurial action,—the calomel and opium may be again exhibited in quantities suggested by circumstances, and several folds of flannel should be wrung as dry as possible out of very hot water, and freely sprinkled with spirits of turpentine, and placed over the abdomen, and covered by oiled silk or by napkins, so as to confine the terebinthinate fumes as much as possible to the part. This *fomentation* ought to be applied as long as it can be endured; and even be repeated in many cases. The admirable effects of it have been proved to me on many occasions at this stage of the malady, both before and since I wrote in favour of it in 1821. (*See a Memoir on Terebinthinate Remedies in Disease*, in Lond. Med. and Physical Journ., vol. xlvi. pp. 107. 185.)

141. The usual effects of this application, after the measures advised to precede it have been duly employed, are a diminution of the abdominal pain, distension and tenderness, and of the irritability of the stomach; a reduction of the frequency of the pulse, which becomes fuller and softer; and a general diffusion of heat, usually with perspiration over the surface and extremities.

142. *b.* It is possible still that the above energetic means may fail, both in arresting the progress of the malady, and in affecting the gums and tongue in the way which is desired. It should, however, be recollected that many cases will proceed favourably, and to complete resolution, without any mercurial effect upon these parts; but when such effect begins to appear, it should be viewed as a favourable indication, and the calomel should either be relinquished or much reduced in quantity, as this effect may rapidly increase. If, however, neither of these beneficial influences appears to follow, depletions being no longer admissible, and the terebinthinate embrocation having also failed, a *blister*, or the vesicating fluids recently introduced, may be applied over the abdomen, and vesication be promoted by a warm bread-and-water poultice. Afterwards, the cuticle should be removed, if the symptoms persist, and mercurial ointment be applied, either on the surface of a poultice, or in the usual way. The object in thus persisting in the use of *mercurials*, as now proposed, is not only to aid in arresting the inflammatory action, but also to prevent the more serious of those consequences, namely, albuminous exudations and serous effusions, which frequently result. They should be exhibited from the commencement of treatment, in full, or in frequently repeated doses, conjoined with opium, so as to aid the bloodletting in making an early and energetic impression on the disease, and not be delayed until an advanced period.

143. I have been called to cases where bloodletting has been pushed too far, with the mistaken idea that the frequency of the pulse is to be reduced by it. But, although this effect is often observed when bloodletting has an immediate influence on the disease, and in healthy or robust persons, yet in other circumstances, particularly in weak, or nervous, or irritable constitutions, the pulse will more frequently become quicker, and even sharper from the repetition of it.

144. *B.* There are *three symptoms* which often increase the difficulty of treating peritonitis, and augment the severity of the disease, and which are often aggravated by the mode of treating them. These are the irritability of the stomach, the constipation, and the flatulent distension of the bowels. To each of these I advert.—*a.* The *sickness* and *retchings* at an early stage of the malady are best encountered by calomel and opium as above advised, and by turpentine fomentations, after bleeding has been duly resorted to, aided in some cases by *creasote* conjoined with the calomel and opium, or by *hydrocyanic acid*. The attempts to allay this symptom by effervescing draughts are generally futile, for the stomach readily reacts upon the distension caused by these draughts and throws off the ingesta. Neither ought much fluid or cold fluids to be given; the mouth and throat should be merely rinsed with tepid fluids, or small quantities of them only be sipped. The retchings or pumping up of the contents of the stomach, characterising a fatal issue, in extreme cases, and often associated with singultus, will not be removed, and seldom even alleviated by any means whatever.

145. *b. Constipation* is frequently removed, even when most obstinate, by the treatment I have advised, without having recourse to purgatives. I have often seen much mischief result from the

officious interference of the practitioner in these cases; the irritability of the stomach, and the severity of the disease being heightened by repeated endeavours to operate on the bowels by drastic purgatives given by the mouth. It is best, at an early stage of the disease, to wait the effects of the treatment advised above, for a reasonable period, and then to have recourse to *enemata* containing spirits of turpentine, with castor or olive oil, or with both, in a thick decoction of barley. These may be repeated from time to time, until the bowels are sufficiently evacuated, without any dread of the complaint being aggravated either by their frequency, or the amount of the ingredients. At a somewhat advanced period of the disease, particularly when the irritability of the stomach has been removed by the calomel and opium, and much flatulent distension of the bowels still continues, from two or three drachms, or half an ounce, to six drachms each of spirits of turpentine and castor oil may be taken on the surface of milk or peppermint water, and repeated according to circumstances. I have often seen this medicine productive of great advantage; and, at a still more advanced stage of the malady, it has remained on the stomach, although vomitings unattended by effort or by retchings were present, and every thing beside was instantly rejected.

146. *c. Flatulent distension* of the abdomen may continue, and perpetuate pain and tenderness, after inflammatory action has been removed or much reduced. In these cases, the flatulence is the result chiefly of the lost tone or contractility of the coats of the bowels; and the distension by gaseous fluids of the tender and inflamed peritoneum, or of the peritoneum independently of inflammation, developes the sensibility of this tissue, and indicates a greater amount, or a longer persistence, of inflammation than actually obtains. A recurrence to bloodletting in any form, in such circumstances, which, as I have had reason to know, is not an infrequent practice, and was formerly much more so, is generally most injurious. The good effects of *terebinthinate enemata* and *embrocations* in these circumstances are almost always remarkable, and are still more when the spirits of turpentine are taken internally, either as just advised, or in other forms, in which I have so often prescribed this medicine and recommended it in the course of this work.

147. *d.* It was advised by the late Dr. SUTTON of Greenwich, and by some German physicians, by whom I have seen many years ago the practice adopted, to apply *cold*, or *evaporating lotions*, or *ice* to the abdomen in peritonitis. If the practice is admissible at all, it is in this form of the disease, and at an early stage of it, that it should be employed. My recollections of it are not, however, such as would induce me to recommend it, whilst my experience of the practice I have prescribed above has been so long and extensive as to fully warrant my commendations. Dr. SYMONDS, however, remarks that, in some cases, cold evaporating lotions have seemed preferable to other applications, the evaporation being accelerated by blowing the surface by a common bellows; and that he has placed the patient in a warm bath, sufficiently long and shallow for him to lie extended, and for the tumid abdomen to rise above the level, so that a jet of cold water could be poured upon the latter. "The relief," he adds, "has been most striking, even when the disease was too far advanced for a cure." (*Op. Cit.*, p. 145.)

148. *e.* When the disease yields, as it usually does, to the above means, when early employed, and the indications of resolution appear, little more is requisite than attention to the state of the secretions and excretions, which should be promoted by gentle alteratives and aperients, aided by an occasional recourse to oleaginous or emollient enemata. As the pulse usually continues frequent for some time after the other symptoms subside, owing to loss of blood and debility, this circumstance should neither create alarm, nor lead to an officious or unnecessary interference. A premature recourse to tonics or stimulants, or to an exciting diet or heating regimen, would be injurious, and lowering measures on the other hand would only protract convalescence. In this state mild diaphoretics and diuretics, as the camphor mixture, with the liquor ammoniæ acetatis and spiritus ætheris nitrici, will generally prove both safe and beneficial; whilst the functions of the skin should be promoted by warm baths, by warm clothing, by flannel worn next the skin, and by avoiding the exciting causes. The lower extremities should always be kept warm; and the bowels and urinary functions ought to receive the strictest attention long after the patient has recovered.

149. *C. The second object*, namely, *to prevent the injurious consequences of peritonitis, and to remove such as may have been already produced*, is best accomplished by a prompt and judicious recourse to the measures already recommended. But the physician may have been called too late to prevent these consequences, — the disease may have advanced to that stage at which one or other of the more unfavourable results described above (§§ 33. *et seq.*) has either supervened, or is in progress. If *effusion* have taken place, or is even proceeding, *bloodletting* in any form may be of little use, or even injurious. Still it may be practised with due caution, whilst the pulse retains some power and is not very frequent, and when the patient is young, and his vital powers not remarkably depressed. In similar circumstances also, *calomel* and *opium* may be prescribed and repeated from time to time; although, at this late period of the malady, the mercurial effect on the system may not be readily, or even at all, produced. A few grains of *camphor*, added to the calomel and opium, will often be of service in these cases. The *terebinthinate fomentation* over the abdomen, and terebinthinate *enemata*, a terebinthinate draught also being occasionally given, are most important measures in these circumstances, whatever may be the amount or the exact nature of the lesions produced by the inflammation. *Vesicatories*, followed by poultices, with or without mercurial ointment, as circumstances indicate, may be applied to the abdomen, as above advised (§ 142.); but they require discrimination, especially as to the period of their application. In most instances they should be large and efficient. In some cases, a prolonged discharge from them may be procured in the usual way; and, when the gums have not been affected by the mercurials previously given, the application of mercurial ointment to their surfaces, the cuticle being removed, will often produce a local and constitutional effect. In other

cases, a repetition of blisters may be requisite, whilst *mercurial alteratives* and *aperients*, as Plummer's pill with soap; the bi-borate of soda with the watery extract of aloes, &c., and *oleaginous* or *emollient enemata*, are being employed. In some instances, especially when much liquid effusion has taken place in the peritoneal cavity, I have directed the following embrocation, sprinkled on two or three folds of flannel, to be applied over the abdomen, and kept there for a considerable time, or even worn for some days, when the amount of irritation produced by it admits of its continued application. In other circumstances a repeated recourse to it should be insisted on:—

No. 307. ℞ Linimenti Camphoræ comp.:—Linimenti Terebinth.; Olei Olivæ. ℥ss, ℥jss. Olei Cajuputi, ʒjss. m. Fiat Embrocatio vel Linimentum.

When the physician is called late in the disease to a case of acute peritonitis it is prone to pass into the chronic state; and this may be the most favourable result which can be anticipated from the extent of lesion already produced. In these instances the treatment about to be mentioned as appropriate to the chronic disease, is in many respects the same as that now advised, and should be resorted to, taking care, however, not to reduce the powers of life so low as to render them unable to resist the extension of the morbid changes.

150. *D.* The *treatment of acute asthenic peritonitis* (§ 26.), is rarely entered upon with any hopes of advantage, unless at the commencement, or at an early stage of the malady; and then the most energetic means are required to arrest its progress, and even they will frequently fail, if they be not employed with discrimination; the extension and course of the disease being extremely rapid, and effusion quickly supervening. This form of peritonitis occurs most frequently in the puerperal state, both sporadically and epidemically, and especially in lying-in hospitals, where it often spreads throughout the wards (see PUERPERAL DISEASES). Instances, however, of this form of peritonitis are observed in other circumstances, especially in connection with erysipelas, and with other maladies already alluded to (§ 26.). In these the chief object is to arrest the extension of the morbid action by those remedies which will make the most powerful impression, and in the shortest period, upon the organic nervous, and vascular systems—an impression which shall enable these systems at the same time to resist the extension of the local mischief, and to remove the changes which have already taken place. After having made trial of various remedies and methods of cure in this form of the disease, the means which I have had reason chiefly to confide in are, a combination of *camphor*, *calomel*, and *opium*, in large doses, repeated every four, five, or six hours, according to the features of the case; in some instances *sulphate of quinine*, camphor and opium, in frequent doses; *epithems* or *fomentations of warm spirits of turpentine* over the abdomen, renewed or repeated according to circumstances; *terebinthinate enemata;* and occasional doses of *spirits of turpentine* by the mouth, with or without *castor oil*, or other medicines. I have employed this treatment since 1823, modifying it with the peculiarities of individual cases; but it is more fully described in the article on the several forms of *fever* and of *peritonitis in the puerperal state*. (See PUERPERAL DISEASES.)

151. *E. Peritonitis from perforation of the stomach or intestines* may assume various forms, according to the circumstances under which the perforation occurs.—*a.* As I have shown above (§ 27.), if it result from chronic ulceration of any portion of the digestive canal, it may be limited to that portion of the membrane more immediately surrounding the perforation; and, coagulable lymph having been effused, that part becomes agglutinated to the opposite surface, and effusion of the contents of the canal into the peritoneal cavity is thereby prevented. In this case, the symptoms only of *partial peritonitis* are manifested, and the disease may assume an acute, sub-acute, or chronic character. An instance occurred in my practice of a female who lived between two and three years after peritoneal symptoms caused by ulceration and perforation of the stomach appeared: she was treated chiefly by *opiates;* and upon dissection, the peritoneum for a considerable space around the large perforation was thickened, adherent to the opposite surface, and almost cartilaginous. (See art. STOMACH.)

152. *b.* In many cases, however, especially when the perforation takes place in the course of continued or exanthematous fevers, and of phthisis, the constitutional powers and the state of the circulating fluids are such as generally admit not of the production of coagulable lymph, and the formation of adhesions between the opposite peritoneal surfaces. In these circumstances, a portion of the contents of the digestive canal escapes into the peritoneal cavity, occasioning a rapid form of *general asthenic peritonitis*. Sometimes, however, the disease continues for a time more or less limited, acute pain and tenderness being confined chiefly to the region in which they were first experienced. In this case, some hopes may be anticipated from treatment. Dr. GRAVES and Dr. STOKES first suggested the most rational principle and means of cure in this state, namely, to enable the constitution to produce coagulable lymph, by which the opposite surfaces of the peritoneum may become adherent, and to keep the bowels quiescent until this end be attained. The most efficient means to accomplish these intentions are, frequent and full doses of *opium*; and the remedial, dietetic, and regimenal measures usually employed to promote the strength of the patient, accommodated variously, so as to suit the peculiarities of particular cases.

153. *E. Peritonitis consequent upon paracentesis abdominis*, or other operations, especially if there be any connection between it and erysipelas (§ 28.), generally assumes the asthenic form, and should be treated upon the principle of enabling the constitution to form coagulable lymph, and of assisting the powers of life to resist the extension of the malady. With these views, *opium*, in full and frequent doses, should be given, and the usual remedial and dietetic means of supporting the vital powers ought to be employed. In short, the treatment advised above (§ 150.) should be adopted, and modified so as to meet the exigencies of each case.

154. ii. TREATMENT OF CHRONIC PERITONITIS. —*A.* In a few cases only of the *general* and *tubercular forms* of the disease can it be hoped, that very great advantage will be procured from treatment. Much, however, may be done in alleviating the more unpleasant symptoms, especially the at-

tendant diarrhœa, and even in prolonging the life of the patient. In some cases, particularly where the powers of the patient are not much reduced, *local depletions*, by means of leeches, repeated as circumstances will suggest, will be of considerable service; but venesection can rarely be attempted. I have found most benefit to be derived from the *turpentine liniment* or *embrocation* recommended above (§ 140.), with the addition of a little of the *iodide of potassium* and *vinum opii*. It should be perseveringly used, and be aided, particularly when there is much liquid effusion, by the *iodide of potassium* given internally with *opium*, or with the *compound tincture of camphor* and *sarsaparilla*. *Opiates* are indispensable in most instances, and more especially when the bowels are much relaxed. They may be given as just recommended, or alone, or with absorbents, mucilages, and emollients. I have employed the iodide of potassium in this disease since 1824, but it is most beneficial when taken in very small doses, and when long persevered in. Even in moderate doses it is prone to develope an acute state of peritonitis; and, in this case the application of leeches, of turpentine fomentations with opium, &c. to the abdomen, is indispensable, in order to subdue the acute or sub-acute action thus produced, the iodide being relinquished.

155. *B. Partial chronic peritonitis*, existing either simply, or associated with chronic visceral disease, is often either permanently removed, or reduced to a state which is not inconsistent with the performance of the functions, even of that organ, the peritoneal surface of which has been more or less implicated. The disease may degenerate into adhesions of a loose or cellular kind, which may not interrupt materially the offices of the connected organs. Still these adhesions may excite further change, may occasion inflammation, or may themselves be the seat of it. It is not infrequently observed, that inflammation of a viscus covered by the peritoneum extends to this membrane, or the inflammation may commence in and be limited to a portion of the peritoneum, in an acute or sub-acute form, and, being either neglected or only partially removed, continues for an indefinite time afterwards in a chronic state. In this case, attention to the functions of the organ primarily affected or consecutively implicated, the occasional application of a few *leeches* when pain or tenderness are felt, followed by warm *fomentations* or the *terebinthinate embrocation*, by *opiates* with *alteratives*, cooling *diaphoretics* and *diuretics*, and such other means as the seat, severity, and associations of the disease will suggest, are the means upon which the chief dependence should be placed. In some instances of this partial state of chronic peritonitis, the *iodide of potassium*, or the *iodide of mercury*, in small doses, may be tried subsequently to a due recourse to the means just mentioned, with the view of reducing adhesions; but the effect should be carefully observed. Partial chronic peritonitis is most frequently observed in the peritoneal coverings of the spleen, liver, and female sexual organs, as a consequence of inflammation of the subjacent viscera, and is there more readily removed by treatment than in other situations; or at least is more easily reduced to a state of comparative innocuousness.

156. iii. The Complications of Peritonitis require attention, in both the *acute* and *chronic states* of this disease. It is chiefly, however, in the partial forms of peritonitis, or early in the more general malady, that these complications become objects of the greatest importance. In every case it is necessary to ascertain, as far as may be, the organ or part primarily affected, and the extent of the super-induced disease; for in many the primary malady will perpetuate the consecutive affection of the peritoneum.—*a*. When *hepatitis* extends to the peritoneum covering the convex or the concave surface of the liver, the portions of this membrane reflected over the diaphragm in the one case, and over the stomach, colon, duodenum, &c., in the other, are often implicated (§§ 71—74.). The disease may even extend further, not merely as regards the peritoneum, but as respects other parts. Thus I have seen diaphragmatitis, pleuritis, and ultimately pleurapneumonia follow hepatitis, on the one hand, and partial or even general peritonitis supervene on the other. In these circumstances, and especially before the disease has thus extended, every effort should be made to bring the system under the influence of mercury as soon as possible, whilst at the same time the constitutional powers should be aided in resisting the further extension of the malady. In addition, therefore, to judicious vascular depletions, calomel, camphor, and opium should be exhibited as above advised (§§ 139. *et seq.*), and be aided by terebinthinate fomentations and enemata.

157. *b. The association of peritonitis with inflammation of the cæcum*, or of the *appendix cæci* (§ 74.), is one of the most frequent and important which comes before the physician. In many instances, as I have shown in the article Cæcum, the impaction of a hard body into the *appendix* perpetuates the inflammation of it, as well as of the peritoneum, and prevents a favourable result, however judicious the treatment may be. When the partial peritonitis caused by the disease of the Cæcum (see that art. §§ 18—20) is acute, the treatment already recommended (§§ 138. *et seq.*) for simple sthenic peritonitis, or that advised above for the complication with hepatitis, should be adopted. I may refer the reader also to the treatment recommended by me for inflammation extending to the peritoneum in the article Cæcum (§ 32.). In the more *chronic state* of this association, the means already prescribed for partial chronic peritonitis (§ 155.) may be adopted, due attention being paid to the secreting and excreting functions of the liver and bowels.

158. *c.* The *associations of enteritis and of acute or chronic dysentery with partial peritonitis* are very common (§ 74.); and, even in general peritonitis, both the small and large intestines are often more or less affected. These complications are generally the most difficult to manage; for, if the bowels be obstinately constipated, attempts to move them by drastic purgatives frequently aggravate the disease. The treatment in this case should be directed almost entirely to the inflammation, and consist of those means which I have advised for the sthenic form of it (§§ 140. *et seq.*), aided by suitable enemata. When the inflammation has been allayed, and the bowels still remain confined, such mild laxatives as may solicit, rather than force, the action of the bowels, only ought

to be employed. On the other hand, if the bowels are much relaxed, or if diarrhœa or a dysenteric state be present, the arrest of the increased discharge from the mucous surface of the bowels may increase the morbid action in the peritoneum, whilst the persistence of the diarrhœa may arise from ulceration, which has either already caused, or will aggravate, the peritonitis. The early history of cases of this kind is the chief guide of the physician, aided by the extent and severity of the peritoneal symptoms. If the diarrhœa be merely an attendant on the peritonitis, as it sometimes is in the asthenic form of the disease, attempts ought not to be made to arrest, or even to moderate it, unless it be excessive, and exhaust the patient; whereas, if the peritonitis, in any form, supervene on diarrhœa or upon dysentery, the persistence of the latter, whether ulceration or perforation exist or not, will aggravate the peritonitis; and, therefore, whilst the chief attention ought to be directed to it, strenuous efforts should also be made to moderate or remove the disorder of the bowels. In the first case, the bowel affection depends upon the peritonitis, and the treatment, as I have advised, should be directed with promptitude and activity to this latter—to the primary and chief disease. In the second case, the disorder of the bowels has not merely caused, but still continues to perpetuate and to aggravate, the peritonitis, and ought therefore to be moderated or controlled even where it might not be prudent at once to arrest it, supposing this to be in our power. In this complication, whatever may be the sequence of morbid action, an extensive experience has proved to me that the terebinthinate remedies, used both internally and externally, are most to be depended upon when judiciously prescribed. That the right use may not be made of them, in respect both of the circumstances and period of the disease in which they should be used, and the modes of exhibiting and combining them; and hence that they will sometimes disappoint many who may have recourse to them, I can fully believe. But in these contingencies they participate with all our other most efficacious remedies. Opium, with grey powder, and with ipecacuanha in large doses, when the bowels are much disordered; appropriate enemata, and other means already noticed, adapted or combined so as to meet the exigencies of particular cases, are also important adjuvants in the treatment of these complications.

159. *d. The association of peritonitis with inflammation, or with organic lesions of the urinary and sexual organs* (§ 75.), is not infrequent, especially among females, and in the puerperal state. In ordinary circumstances, the associated peritonitis is generally consequent upon the visceral disease, and is commonly partial, unless in puerperal or cachectic states, or in the course of fevers, where it often rapidly becomes more or less general. It sometimes also passes into a chronic form, especially when it is consecutive of organic lesions, or is independent of the puerperal condition. In these several associations, the treatment should partly depend upon the extent of the peritoneal affection, and upon the degree of vital power characterising the disease. When the asthenic and diffusive form is present, the treatment advised above is most appropriate (§ 150.); but when the more sthenic and partial or limited state of morbid action exists, then the means already recommended (§ 140.), is that which is most beneficial for this state of complication. In either case, the peritonitic disease claims the more immediate and the chief attention, as upon the limitation or extension of it depends the recovery or the loss of the patient. It being arrested, or more or less subdued, the treatment should be more strictly directed to the primary lesion of the sexual organs; and the functions of these organs ought to be promoted, especially as respects the menstrual discharge. Even after the disease is apparently subdued by the vascular depletions, &c. prescribed above, still pain or tenderness often recurs, especially about the expected catamenial period, and is sometimes attended by scanty or difficult discharge. In such cases, leeches should be applied below each groin, and be followed by fomentations, as already advised (§ 140.), by small doses of the biborate of soda in camphor and orange-flower water; and by such other means as the peculiarities of individual cases will suggest.

160. iv. TREATMENT OF PERITONITIS IN CHILDREN.—*A.* The principles of treatment which I have advocated for adults are also applicable to children. In the latter class of subjects, however, *acute peritonitis* generally assumes a *sthenic* or phlogistic character, unless when it follows eruptive fevers or mesenteric disease, when a subacute and diffusive state is often assumed, not infrequently lapsing into the chronic form, particularly in the scrofulous diathesis. In the more sthenic of these states of disease, local depletions, calomel, terebinthinate fomentations and injections, emollient warm baths, with the other means already advised, according to the circumstances of the case, are the measures upon which our dependence ought to be chiefly placed. When peritonitis follows the maladies just mentioned—when it presents, either locally or as regards the constitutional symptoms, the asthenic, diffusive, or subacute state, calomel with camphor, and with opium in small doses when the age of the patient will admit of this last, and terebinthinate remedies in the several forms already prescribed, and duly repeated or continued, are the principal means of cure.

161. *B.* If the disease pass into the *chronic state*, or assume this form primarily,—if it be *tubercular*, as it most frequently is, or *simple* and attended by fluid effusion into the peritoneal cavity—a cautious recourse to *iodine*, especially to the proto-iodide of mercury, to the iodide of potassium, with liquor potassæ and sarsaparilla, and a frequent or continued use of the terebinthinate embrocation over the abdomen, as above advised (§§ 140, 141.), either with or without the iodides externally, should in no case be neglected. But they should be perseveringly employed, and the iodides ought to be given only in very small doses, especially at first; and be aided by change of air, and exposure to light and sunshine. When chronic peritonitis is attended in children by diarrhœa, when it is far advanced, and its tubercular nature manifest, then ulceration, or at least a state of lesion almost precluding hope, may be inferred. Our treatment should then be directed to the alleviation of urgent symptoms,—to the moderation of the attendant diarrhœa and pain by means of absorbents and opiates, by hydrarg. cum creta

with compound ipecacuanha powder, and warm baths, or fomentations over the abdomen.

162. v. CONVALESCENCE *from any of the forms of peritonitis* requires the utmost care and caution, especially in respect of *diet* and *regimen*. During the continuance of the disease, particularly in the acute form, bland or emollient fluids only should be allowed. The compound decoction of barley may be taken in small quantities; and when a relaxing effect upon the bowels is desired, then about a drachm of oleum olivæ may be given on its surface, three or four times in the day, or oftener. In the acute state of the disease, this, or simple barley, rice, gum-water, rendered agreeable with liquorice powder, is all that is required, both as drink and as aliment. In the chronic states, however, or during the early stage of convalescence from the acute, the same watery decoctions, with small quantities of ass's or other milk, or weak arrow-root or other farinaceous substances, may be allowed; and subsequently, according to the progress of the case or the amount of debility, mutton or veal or chicken broths, or beef tea, in small quantity, with dry toast, or with boiled rice or stale bread, may be cautiously permitted. The greatest caution should be used in returning to animal food; and that which is the mildest, least stimulating, and most digestible only should be allowed, in small quantity, once in the day. All heating or stimulating beverages, and flatulent or ascescent vegetables, ought to be avoided. Chocolate or cocoa-nibs should be substituted for tea and coffee; and, in the case of infants or children, ass-milk warm from the animal, either pure or diluted, is one of the best articles of food as well of drink that can be administered.

163. During the course of, as well as convalescence from, this disease, a perspirable state of the surface ought to be preserved by flannel worn constantly next to the skin, by warm baths rendered emollient by an alkali, by decoction of marsh-mallows or infusion of linseed, &c. If the bowels after recovery continue irregular or constipated, the emollient decoctions or infusions may be employed as enemata, to which oleum ricini or oleum olivæ may be added; and small doses of these, particularly of the latter, may be taken frequently, on the surface of any suitable diluent or demulcent until a regular action shall be established.

XI. ORGANIC LESIONS OF THE PERITONEUM, INDEPENDENT OF INFLAMMATION.

CLASSIF.—IV. CLASS. I. ORDER (*Author.*)

164. i. DESCRIPTION.—The lesions of the peritoneum which have already been noticed have chiefly been those which are consequent upon inflammation, in some one or other of its several forms or types. Tubercular formations are, however, an exception; and these have been noticed only incidentally, and in as far as they are associated with chronic peritonitis, particularly in scrofulous constitutions. A brief notice only will be taken of those changes which are not essentially caused by inflammation, as they are generally, especially in the circumstances in which they usually present themselves, but little influenced by medical treatment. Certain of these changes affect rather the attached surface, or the sub-peritoneal tissue, than the peritoneum itself; whilst others consist in the presence of fluids altogether foreign to the peritoneal cavity.

165. *A. Various changes of colour* are occasionally presented by the peritoneum, which are independent of inflammation.—*a. Yellowish* or even *greenish tints* are sometimes observed in those parts of the membrane in the more immediate vicinity of the gall-bladder, and are owing to the exudation of bile. The extent and the intensity of the colour generally depend upon the colour and quantity of bile contained in the gall-bladder and ducts, and upon the duration of the period from the death of the patient. Various shades of colour are often observed in the peritoneal surfaces of the liver and spleen, and are generally owing, when they are very deep or dark, bluish or brownish, to venous congestion of these organs, or to accumulations of black viscid bile in the hepatic ducts. These deep shades of colour are most remarkable in warm climates, after hepatic, periodic, and other fevers.—*b.* The peritoneum may also present a *reddish hue*, without having been inflamed. This always is owing to the escape of blood, from accident or rupture of vessels, into the peritoneal cavity; and hence its nature is apparent. It is always a *post-mortem* change.

166. *B. The sub-peritoneal cellular tissue* is not infrequently the seat of various changes which, although sometimes connected with, is oftener independent of, inflammatory action.—*a. Œdema* of this tissue is occasionally observed in consequence of chronic disease of the heart, liver, lungs, or kidneys; and is most conspicuous in those situations where the cellular tissue is most abundant and loose; as in the vicinity of the pancreas, kidneys, and sexual organs.

167. *b.* Minute transparent *vesicles*, varying from the size of a millet-seed to that of a pea, or even of a marble. They occur most frequently about the Fallopian tubes, ovaries, and broad ligaments. *Serous cysts* are not infrequently found between the folds of the broad ligaments, and sometimes attain the size of a large orange, simulating ovarian disease, and constituting one of the forms of encysted dropsy. (See art. DROPSY, §§ 206. 212.)

168. *c. Tubercles* and *scrofulous tumours* are the most frequent and important organic lesions primarily occurring in the sub-peritoneal cellular tissue independently of inflammation, although, with all other morbid formations in the same situation, generally inducing chronic inflammatory action in their progress. Scrofulous tubercles in this situation, and when well defined, seem to be encysted, owing to the condensation of the cellular tissue directly investing them. Dr. HODGKIN states that these scrofulous tubercles or tumours are most frequently seen, and are the largest, between the folds of the mesentery; but they obviously implicate the glands in that situation. They also attain a considerable size in the omentum. Under the peritoneal coat of the intestines they are generally small, but numerous. Dr. HODGKIN considers the small miliary granulations which I have described above (§ 107.) as consequences of inflammatory action, and which are found both below and in the peritoneum, to be incipient tubercles. I have already endeavoured to distinguish between those granulations which seem to result from chronic inflammation and scrofulous tubercles.

169. *C.—a. Malignant deposits or formations* of a *scirrhous* or *fungoid character* occur occasionally

on the attached surface of the peritoneum, and sometimes they extend from the subjacent structures, and invade this membrane. Dr. HODGKIN remarks, that in the former case the tumours which result are often remarkable for their size, number, and diffusion; but that, even in these, some portions of the peritoneum more frequently escape than others. Thus, these morbid growths are not so often met with on the parietes as in the omentum, or in the intestines; and when formed in the parietes they are generally of a smaller size. Neither the mesenteric glands nor the other organs invested by the peritoneum are apt to become affected by the extension of the disease. These growths are sometimes, although not necessarily, attended by serous effusion into the peritoneal cavity, causing distension, which is occasionally very considerable. When the disease is propagated from the primarily affected organ, it is generally to the vicinity only; thus, in scirrhus of the pylorus, a sprinkling of minute scirrhous tubercles is often seen under the peritoneum in the neighbourhood; and in malignant disease of the uterus, the convolutions of the intestines which happen to come in contact with it often exhibit growths of a corresponding character beneath their peritoneal coat.

170. *b.* The *free* or *internal surface* of the peritoneum is very rarely the seat of malignant growths. Dr. HODGKIN, however, met with two instances, in which it was the seat of these growths; but in these, malignant formations also were found in organs invested by this membrane, and were manifestly developed primarily in these organs. In one case, in addition to fungoid disease of the kidney, there were small malignant tubercles situated in and beneath the peritoneum, and others seated on the free surface of it; and in the other case these tubercles were scattered beneath the peritoneal coat of the intestines, and on its free surface, the chief and primary fungoid tumour being in one of the ovaries.

171. *c. Melanosis* also is sometimes met with, invading, rather than primarily affecting, the peritoneum; and it is chiefly observed on the attached surface of the membrane, to which it has extended from the subjacent structures and cellular tissue; where, however, it presents the usual characters assigned it when treating of it elsewhere. (See art. MELANOSIS.)

172. Although scrofulous tubercles and scirrhous and fungoid productions affect the peritoneum independently of inflammation, and appear in those circumstances, and from causes, which are fully developed in the articles devoted to those several subjects, still they not infrequently are found accompanied with more or less abundant effusion of serum, and with bridles or films of adhesion, indicating, the latter especially, that a chronic form of inflammatory action had been excited by their presence, and in their vicinity.

173. *D. True hydatids* or *acephalocysts* are sometimes produced beneath the peritoneum, and occasionally they attain a very large size, so as to resemble encysted dropsy, from which they are with difficulty distinguished during the life of the patient, especially when they form between the folds of the broad ligaments of the uterus. They are met with chiefly under the peritoneal covering of the liver, beneath that of the spleen, in the broad ligaments, and in the mesentery; but the first is their most frequent seat. They may burst into the peritoneal cavity without producing any signs of inflammatory action; but a chronic and limited state of inflammation may be occasioned by them. In either of these situations they may pass through those changes which have been described when treating of them. (See art. HYDATIDS, §§ 15—25.)

174. *E. Ecchymoses* and small *bloody points* are occasionally found in the peritoneum, owing to minute extravasations of blood, caused by diminution of the tone of the capillaries and of the vital cohesion of the sub-peritoneal tissue, and probably also of the peritoneum itself. They are most frequently observed under and in the peritoneal coat of the small intestines, but are also sometimes met with in other situations. They occur chiefly in purpura hæmorrhagica, in adynamic fevers, and in scurvy, in which last I have observed the ecchymoses assume the form of vibices or patches as large as half-crown pieces. Dr. HODGKIN remarks that he has seen the peritoneum sprinkled with small bloody points, not only in purpura, but also in jaundice.

175. *F. Various substances foreign to this situation are sometimes found within the peritoneal cavity.*—*a.* The most common is an accumulation of *serous fluid*. This fluid may result from increased exhalation of serum, arising from congestion, or impeded return of blood from the abdominal viscera, consequent upon disease of the liver, heart, lungs, kidneys, &c. In these circumstances, the effused fluid contains comparatively but little albumen; and when this is the case, and the more watery and limpid the effusion, the less prone the peritoneum is to be irritated or inflamed by it. Still, a state of chronic inflammatory action is sometimes induced by the state and quantity of the effused fluid, affecting chiefly the omentum and mesentery, and occasioning more or less shrinking of these parts. The disposition also to chronic, or even to acute asthenic peritonitis, occasioned by serous effusion into the peritoneal cavity, is further evinced by the frequency of its supervention upon *paracentesis abdominis*. It has been stated above (§§ 101, 102.), that the effusion of fluid into this cavity consequent upon inflammatory action is often very great; but, in this case, whatever may be the form of inflammatory action producing it, the fluid contains more or less albumen, occasionally also blood-globules or colouring matter, and even pure or dissolved blood, although much more rarely; and the peritoneum is altered in structure, or it presents other morbid products.

176. *b. Blood*, fluid or coagulated, recent or partially altered, pure or mixed with serum, &c., is in rare cases found in this cavity; but generally in consequence of rupture of some one or other of the invested organs, or of an aneurism. BROUSSAIS contended that it is sometimes effused in considerable quantity, owing to a hæmorrhagic peritonitis, or to a state of action partaking of both an inflammatory and a hæmorrhagic character. This may be probably the case, but on rare occasions. Hæmorrhage may also occur into this cavity to a considerable extent, owing to the ulceration attending some states of chronic peritonitis, of which I have met with a remarkable instance. When blood is effused into the cavity owing to wounds, injuries, &c., it always rapidly produces inflammatory action, which is followed by the

effusion of coagulable lymph, if the powers of the constitution are not remarkably depressed; and this lymph may limit or surround the blood effused, and thus in some respects isolate or encyst it, and thereby even confine and ultimately repair the mischief. The effused lymph, by subsequently becoming organised in the manner described (§§ 82—84.) may even give rise to various changes in the blood surrounded by it, similar to those remarked in coagula found some time after extravasation into the parenchyma of organs.

177. A partially decomposed blood, mixed with more or less serum, or a sanious fluid, is in rare instances found in the peritoneal cavity unconnected with inflammation, and chiefly in the same circumstances and in the same cases as have presented ecchymoses of the peritoneum. This state of the effused fluid I have seen only in scurvy, purpura, adynamic fevers, malignant puerperal fever, and malignant small pox; and in these circumstances the sanious or bloody state of the effusion, as well as the ecchymoses, is owing as much to alteration of the blood as to the impaired vital cohesion of the peritoneal surface and capillaries.

178. *c. Chyle, bile, urine,* and even the *amniotic fluid* have been found in the peritoneal cavity, but only in consequence of wounds and injuries of the peritoneum and parts involving the vessels concerned in transmitting, or the organs containing, these fluids. Rupture of the fundus of the urinary bladder, or of the uterus, is necessarily followed by the escape of the contents of these organs into the peritoneal cavity. *Purulent matter* is sometimes found in this cavity independently of inflammation of the membrane, owing to the bursting of an abscess, especially of that of the liver. *Tubercular matter* is in rare instances found in this situation, owing to perforation of the peritoneum, particularly after scrofulous or tuberculous disease of the mesenteric glands, and in chronic tubercular peritonitis. The *alimentary, fæcal,* or *gaseous* contents of the *stomach* or the *intestines* occasionally escape into the peritoneal cavity, and even *intestinal worms* are also in rare cases found there, owing to perforation of these viscera, either no adhesions, or partial adhesions only, having existed between the opposite peritoneal surfaces adjoining the perforation. In all cases of the passage of these foreign substances into the peritoneal cavity peritonitis is quickly induced, and extends with a rapidity coordinate with the acridity, quantity, and diffusion of the foreign substance and the susceptibility of the patient.

179. *d.* It has been shown above (§ 119.) that *gases* are sometimes found in the peritoneal cavity, causing more or less true peritoneal *tympanitis* or *meteorismus,* owing to the partial decomposition of a portion of the products of inflammation, especially when these products are long retained. This source of the gases sometimes found in this cavity is now generally admitted by pathologists. But it has been supposed—been contended for by some and denied by others—that air may be secreted on the free surface of the peritoneum, independently of inflammatory action. PORTAL, COMBALUSIER, FRANK, and others have adduced instances of the accumulation in this cavity of air, independently of either disease of the membrane or perforation of the digestive canal. There is no doubt of the secretion of air from the digestive mucous membrane, independently of any obvious structural disease of it; and whilst the possibility of a similar phenomenon occurring in respect of the peritoneal coat of the digestive tube may be admitted, the rarity of its appearance cannot be questioned. SCOUTETTEN believes that he has found air in the peritoneal cavity without any lesion of the membrane; but was it secreted there before death, or produced afterwards? M. RINKS considers that an elastic fluid exists in the serous cavities, arising from the vaporisation of a portion of the secreted serosity with which they are provided.

180. *e.* Perfectly *detached bodies or concretions,* generally of a rounded farm, are sometimes found in the peritoneal cavity. They are of a semicartilaginous, cartilaginous, or even bony character. They vary in size from that of a pea to that of a cherry. Dr. HODGKIN remarks, respecting their formation, that "they commence as an isolated clot of coagulated lymph; the smooth convex surface of which has contracted no adhesion, either to the serous or to any other portion of false membrane. In process of time the surface acquires a sufficiently membranous and firm consistence; and the detached body, instead of forming a clot of cheesy matter, contracts, losing its serous or watery part. If this take place rapidly, and materially reduce the size of the detached body, the surface exhibits an uneven and corrugated appearance. When of small size, they more often retain their smooth surface, an increasingly firm structure, which becomes loaded with earthy matter, as I apprehend, by a process of endosmosis. These detached bodies may be seen in the most recent state, wholly consisting of coagulable lymph, having a cellular character, infiltrated with serum, and presenting the figure and size of an egg-plum, somewhat flattened; but I have never seen them, in the firm and advanced stage which I have described, larger than a pea or a marble." (*Op. Cit.* p. 53.)

181. Now without questioning that some of the bodies, in their recent or soft state, or in that of lymph, are produced in the manner for which Dr. HODGKIN has argued, or consists of portions of lymph thrown out with, or isolated by, a liquid effusion produced at the same time, still the subsequent changes, whether cartilaginous or earthy or bony, cannot be explained conformably with this opinion, even although the process of *endosmosis* be called in aid of it. I believe that the lymph, formed in a greater or less clot, or mass, and with more or less serous effusion, continues connected with the peritoneum by a narrow neck or pedicle, through the medium of which successive changes take place in it; and that, with the condensation and contraction of this mass, the pedicle also shrinks, becomes thinner, and is at last destroyed or broken off, the body ultimately being altogether detached. That it should undergo the successive changes of cartilaginous, osseous, or earthy degeneration, after its complete separation from the living structures, as Dr. HODGKIN supposes, is countenanced neither by analogy, nor by observation, nor by what is known of the process of endosmosis.

182. ii. THE SYMPTOMS of those organic lesions of the peritoneum which have now been described are extremely equivocal and obscure. Many of these lesions are detected only after death, and are

associated with alterations of other or connected organs or parts, which assume a more prominent place in that state of more or less general disturbance, or of cachexia, which is usually present. Where there is effusion of fluid into the peritoneal cavity, this may be readily detected, but it may be complicated with one or other, or even with more, of those changes of the membrane which have just been noticed, and which the effusion may mark, or which may not be evinced by any characteristic phenomenon. When the alteration is of a malignant kind, it will generally be attended, at least at an advanced stage, by a cachectic, anæmial, and languid or debilitated state of the frame. Even when a distinct tumour is present, its exact seat will frequently be undeterminable, and it will be equally impossible to ascertain the extent to which the peritoneum is implicated by it. The matter can at best be one of inference, to which the physician will be led by a number of varying circumstances, many of them peculiar to individual cases.

183. Of all these lesions, probably hydatids seated beneath the peritoneal covering of the liver is that which is ascertained with the greatest certainty during the life of the patient. Yet this is not always the case, for much depends upon the particular part to which these parasites are attached, upon the size of the tumour they produce, and upon various attendant circumstances. But the symptoms are stated in the article LIVER (§ 232.). Some of the lesions, whilst they only partially, or even to a small extent, invade the peritoneum, are seated chiefly in organs or parts enveloped by this membrane; their precise seat being indicated chiefly by the way in which particular functions are disturbed, and the amount of the disturbance. If the lesion consist of a deposit of morbid or heterologue matter, occasioning more or less tumour, the seat and relations of it, viewed in connection with the kind and extent of disordered function, and with the evidence of constitutional disturbance manifested in both the nervous, vascular, and cutaneous systems, will generally furnish some indication of the nature of the malady, particularly when aided by the state of sensibility evinced during a careful examination of the different regions of the abdomen and pelves, and by percussion. Still the amount, as well as the exact nature, of the peritoneal lesion may not be made apparent; and it may not even be easy to ascertain, whether or not the alteration be one proceeding from chronic inflammation, or one or other of those which I have now considered as being independent both of inflammatory action and of its usual results. It is chiefly by comprising within our mental vision all the circumstances and phenomena characterising the causes, origin, progress, and full development of the case, that an approach can be made to a just view of the nature of the distemper.

184. iii. THE CAUSES of the organic lesions which I have viewed as altogether independent of inflammatory action, although sometimes associated with, or productive of, a state of asthenic or chronic inflammation, vary according to the nature of the existing lesion; each of these lesions proceeding from predisposing and exciting causes, which are more or less peculiar to it. Thus the *tubercular*, the *scirrhous*, or the *fungoid deposits* formed beneath or invading the peritoneum, proceed from causes which are enumerated in the articles devoted to these diseases. The same remark applies to *hæmorrhagic*, *hydatidic*, and other changes implicating this membrane; these appearing from the same causes and in the same circumstances, as give rise to them in other situations. Of all the alterations of structure, however, which have now been briefly noticed, it may be stated, in general terms, that they commonly proceed from, and are characterised by, both at their commencement and during their course, a condition of the vital powers and of the circulating fluids that have been fully described in the articles DEBILITY and DISEASE. *Debility*, appearing either primarily or consecutively, as shown when treating of this subject, or in other words, depression or exhaustion of vital energy, by occasioning those changes in the assimilating, the circulating, and depurating organs and functions, which I have fully developed in the articles BLOOD and DISEASE, gives rise to the several alterations of structure just described; one or other of them appearing, according as the predisposition resulting from original conformation, temperament, age, and modes of living, and as the influences exerted by air, climate, mental emotion, previous or concomitant disease, &c., determine its character or relations.

185. iv. THE TREATMENT of organic lesions of the peritoneum, like the consideration of the causes producing them, should have strict reference to the nature of the alterations inferred to be present in each case. Still the same principles are applicable to nearly all of them—whether of prevention, of alleviation, or of cure. It has just been stated, that all these lesions generally originate in depression or exhaustion of vital power, and in its more immediate consequences in the assimilating, circulating, and depurating functions and organs; and a reference to those articles where these distempers are fully discussed, and with due reference to their causes, will fully confirm the general statement now made. It must, therefore, be manifest, that a continuance of the primary morbid condition will necessarily aggravate or increase the consecutive changes, and thereby favour the developement of the specific organic lesion, and its inroads upon the constitution. On the other hand, it must be equally evident, that whatever has the influence to remove the primary morbid condition—to rally or promote the depressed or exhausted powers of life—to aid the assimilating, circulating, and depurating functions, will most efficiently resist the progress of the organic mischief, and even overcome it ultimately, (although we should seldom be so sanguine in our expectations), when it has not advanced so far as to impede the functions of life, or when it is not of a nature which precludes hope of ultimate success. By enabling the constitutional energies to resist the advancing evil, we may succeed in prolonging the contest,—we may very considerably prolong life, even when we cannot hope to avert an ultimately fatal result.

186. Having determined the principle of treatment, the means which range themselves under it are readily suggested; the selection of them depending upon the inference drawn from previous and existing phenomena as to the nature of the particular case. The number and varying characters of the alterations just described, the dif-

ferent and even changing circumstances in which they appear, and the numerous visceral maladies with which they are generally complicated,—these maladies often being the original evils from which the peritoneal lesion springs, or by which the membrane is invaded,—preclude the possibility of noticing the several methods of treatment, the numerous means of cure or of palliation, and the interminable modes of combining these means, that may be employed in these pathological conditions. I can only indicate the general character of the means which experience has shown to be most beneficial, and notice a very few from among these means which deserve to be employed.

187. I have just now contended that the only remedies which should be resorted to in the organic lesions of the peritoneum are those which support or rally the depressed powers of life. Unfortunately, many of these lesions invade the peritoneum consecutively of a protracted existence in some one of the viscera enveloped by this membrane, and not until vital depression and constitutional contamination have made considerable progress,—or they may not come before the competent adviser until reasonable expectations of cure are precluded, either by their nature at their commencement, or by the amount of disorganisation. Still, in either case, the chief *indication* is nearly the same for all, namely, *to enable the powers of life to resist as long as possible the further progress of disorganisation; and, when the case admits of the attempt, to aid them in removing whatever alteration of structure may have already taken place.* It is very obvious that this object can be attained only by those means which support, or rally without exhausting, vital energy; and which at the same time aid the due performance of the several digestive, assimilating, and depurating functions. Care should be taken always to keep the stomach in good humour, by the aid not merely of *medicine*, but also of suitable *diet* and *beverages*. The *medicines* most appropriate to the peculiar features and complications of the case should be selected, and their influence upon the functions of digestion and excretion carefully observed. Although tonic or restorative medicines are requisite, yet those which are the best suited to the circumstances of the case, and the temperament or idiosyncrasy of the patient, ought to be studied. Where there is increased irritability of the system, with a frequent or excitable pulse, the milder vegetable tonics or bitters only will be tolerated; and these may be prescribed with calmants, as the hydrocyanic acid, HOFFMANN's anodyne, or with henbane, conium, morphia, or other preparations of opium. If more or less anæmia be present, chalybeate medicines, selected and combined according as the peculiarities of the case suggest, are the most appropriate. It will be often beneficial to combine alteratives with tonics or restoratives; and the choice of those is generally difficult, as those which depress vital power, or irritate the stomach, are generally prejudicial. The preparations of sarsaparilla and of iodine are the most efficacious when judiciously administered; but the latter should be prescribed in very small doses, especially at first, and the iodide of potassium be preferred. This medicine may be given with the liquor potassæ or with sarsaparilla, or in tonic infusions or decoctions; or with the liquor potassæ in HODGSON and ABBOTT's* pale ale, a beverage which I have for many years recommended in several disorders characterised by more or less debility. When the iodide of potassium is found to agree with the patient, the iodides of mercury may also be given in small doses at bed-time, with an anodyne or opiate. If anæmia exist, the iodide of iron should be prescribed in the syrup of sarsa, and the advantages of light and sun-shine enjoyed as far as may be prudent. The several emunctories ought to be duly aided in their functions; the regular action of the bowels and of the kidneys promoted; and the insensible perspiration increased by wearing flannel next the skin, and by keeping the extremities always warm.

188. If the stomach be irritable, creasote may be given, with or without opium or acetate of morphia; or hydrocyanic acid may be prescribed in demulcents or emollients; and such *beverages* be selected as will support the strength, and agree best with the digestive organs. In some cases, the pale ale just mentioned may be made the vehicle of various medicines, according to the exigencies of the case; but, in every instance, and particularly when the stomach is weak and irritable, tea ought to be avoided. Chocolate or cocoa-nibs are preferable; or a little milk, with seltzer, soda, potass, or magnesia water. The choice of these or of mineral waters should depend upon the nature of the case, and especially of the visceral disease characterising it. The *diet* and *regimen* must be regulated by the same circumstances.

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* I recommend this beverage in preference to the various imitations of it which have more recently appeared, because I know that it is pure, well fermented, and prepared from the best materials. The utmost precautions are also taken against adulteration. For many years it was the only article of the kind, and it is still the most wholesome.

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PESTILENCE.—Under the head *pestilence*, I comprise certain maladies which have appeared as wide-spreading and devastating epidemics, but which have surpassed all other epidemics in their rapid extension, in their fatality, and in the duration of their prevalence. Nor have they appeared only as most fatal epidemics, for they have continued, in countries favourable to their perpetuation, to appear from time to time in a much less alarming and obtrusive manner; occurring for a time only in few or widely scattered instances, and at more distant intervals, until certain favourable circumstances, arising out of predisposition, atmospheric constitution, or some unknown, but more generally diffused influence, have arisen and rendered what had been either unsuspected, or but little feared, suddenly most manifest, diffused, fatal, and appalling. To these irruptions, to their rapid extension, and to their great fatality, the generic term *pestilence* may be justly applied: and the history of medicine, in recent times, furnishes *three maladies*, to which this term is especially applicable, namely, the recent distemper, which has generally but injudiciously been called *cholera*, *yellow fever*, and the *plague* or *pest*. To these might be added, perhaps, small-pox, scarlet fever, measles, and some other infectious fevers; but these diseases only occasionally, or even very rarely, and then only in peculiar circumstances and in certain races, assume forms which, as respects either malignancy, prevalence, or fatality, can entitle them to be placed in the same category with those now about to be considered.

1. If the *history of pestilences*, or of *pestilential epidemics*, be studied in Grecian, Roman, and Arabian writers, and in the writings of the fourteenth and fifteenth centuries, it will be manifest, that the *causes* to which these pestilences were imputed are nearly the same as have been assigned in modern times. HIPPOCRATES ascribed epidemics generally to the food, drink and air; and GALEN, with LUCRETIUS, AVICENNA, and others who copied him, considered atmospheric heat, and the miasms exhaled from the soil and from the putrid bodies of animals, as the chief causes of all pestilences. AVENZOAR enumerates, as their sources, a warm and humid air, unwholesome food, and emanations from stagnant water and from dead bodies. HALY ABBAS assigns the same causes as AVENZOAR, but attributes a share of the influence to the nature of the seasons. From HOMER to the present time, considerable influence in the production of pestilences has been imputed to great heat of the sun and to very hot seasons. DIODORUS SICULUS ascribed the plague of Athens and the disease which attacked the Carthaginian army in Sicily, to the excessive heat of the sun, to exhalations from the soil, and emanations from the bodies of the dead. AMMIANUS MARCELLINUS considered extremes of heat or of cold, of drought or of moisture, exhalations from the earth, and the effluvia from the dead and from putrid animals, as the chief causes of pestilential epidemics. But, although these were assigned as the chief causes of pestilences by nearly all the ancient writers, still others, and particularly infection and contagion, were also viewed, as I have shown in the articles EPIDEMIC INFLUENCE and INFECTION, as contributing to their propagation. THUCYDIDES, as Mr. ADAMS, the learned translator of PAULUS ÆGINETA, remarks, evidently considered the plague of Athens infectious, for he mentions, that physicians were more attacked by it than others, as having most intercourse with the sick; and he describes the terror which the citizens felt to approach the affected, and intimates that it was often contracted by such intercourse. Many historians, poets, and physicians among the ancients, since THUCYDIDES, have considered pestilential epidemics to be infectious—not always, however, by contact, but more generally by emanations from the sick, which contaminate the surrounding air, as shown in the article INFECTION (§ 11. *et seq.*). MARX, OMODEI, ADAMS, and others have referred to the opinions of the ancients on this subject, in order to disprove what had been falsely alleged by a few writers of small reputation, that the doctrine of infection or contagion was altogether modern. That the ancients, however, entertained correct views of the matter is evident from a reference to the writings of ARISTOTLE, LIVY, PLINY, DIONYSIUS of Halicarnassus; DIODORUS SICULUS, APPIAN, PLUTARCH, QUINTUS CURTIUS, DIO CASSIUS, EUSEBIUS, MARCUS ANTONINUS, CHRYSOSTOM, SENECA, and ISIDORUS HISPALENSIS. The last of these remarks that—"Pestilentia est contagium quod quum unum apprehenderit celeriter ad plures transit." "Pestilentia est morbus latè vagans et contagio suo quæ contigerit interimens."

2. A belief in the infectious or contagious nature of pestilential fevers and some other diseases was entertained by ARETÆUS, CÆLIUS AURELIA-

nus, Galen, Aëtius, Paulus Ægineta, and by several of the Arabian medical writers. Mr. Adams remarks, that the result of his examination into the opinions of the ancients on this subject leads him to the conclusion that all, or at least the most intelligent of the medical authorities, held that pestilential epidemics are communicated, not by any specific virus, but by the contamination of the surrounding air by effluvia from the sick. As to this, as well as to other sources of pestilential diseases, the ancients did not differ materially from the best informed of the moderns. Indeed, faithful observers in all ages must have arrived at nearly similar conclusions; for, although various subordinate circumstances may have changed with the progress of time, and some causes may have assumed more intense, and others less prominent forms, still the chief and efficient sources and influences must have been reproduced in the succession of ages after indefinite intervals in those states and combinations which develope and propagate either pestilence or less malignant epidemics. If we consider the changes continually taking place near the embouchures of rivers with the progress of time, the deep and exuberant soil that is there accumulating, and the frequency of inundations,—if we reflect upon the circumstances affecting the physical conditions of large cities, and upon the contaminations of the air, water, and soil, arising from these and other crowded and ill-ventilated places of human resort,—we shall find causes sufficient to explain a portion of the morbid phenomena, but not the whole, which present themselves to the physician, especially during warm and humid states of the atmosphere, and under the influence of certain electrical conditions, or of unusual stillness of the air. Yet even these are not of themselves sufficient to account for all the phenomena which occur during the prevalence of destructive epidemics. Conceding all that can be contended for as to the baneful influence on the human constitution of exhalations from rich, deep, and humid soils, into a warm, stagnant, and moist atmosphere; of effluvia from the exuviæ of living human beings and other animals congregated in masses in camps, cities, and towns; of emanations from dead and putrefying bodies, insufficiently covered by the soil, and diffusing their elements through the soil, and transmitting them to the atmosphere within or around these localities; and of the water of these places impregnated with putrid animal matter—granting, in their full force of pestilential generation, the infecting influence of these causes, still an additional cause is required to explain many of the phenomena falling under the cognisance of the physician; and that cause often presents itself in a manner that cannot be mistaken, and, in many instances, in such a way as admits not of dispute. That other and most influential cause, often superadded to, or generated by, the foregoing, is *infection*, or, as I have shown in the article on this subject, the effluvium or miasm which emanates from the sick, contaminates the surrounding air, and the patient's day or night clothing, and thereby propagates to the healthy a disease similar to that from which itself proceeded, and often in circumstances and in situations where the other sources of the disease cannot have existed.

3. If the circumstances, physical and moral, characterising congregations of our species, whether in camps or in cities, in ancient times, be considered as far as we possess the information, and be compared with those which exist in respect of similar congregations and localities at the present day, we shall find that, although a few causes of malignant disease are no longer in operation, others have sprung up, and have become excessively injurious, notwithstanding that numerous influences aid in counteracting or limiting the mischief. Many of the rites, even of religion and of superstition, during early ages and in pagan countries, tended remarkably to diminish the sources of infection and of pestilence. The embalming of the dead by the Egyptians and other ancient nations, the laws rigidly enacted by Moses and enforced by Jewish rulers, the burning of the dead by several nations, and the modes of sepulture adopted by the Chinese from the earliest ages, were all more or less calculated to prevent the bodies of the dead from proving sources of destruction to the living. But with Christianity and with the superstitions which were successively engrafted upon the purest and most sublime doctrines, sprang up practices of the most injurious tendency to public health, and these have now, particularly in large towns, advanced so far as to become matters of traffic with some of those who profess the greatest anxiety for the souls, if not for the health of their species. The desire of depositing the dead within the consecrated sphere of spiritual instruction, or of boasted inspiration, became general, and the places of such deposit also became, especially in recent times, a source of emolument. Thus religion was made, even by the sanctimonious, the handmaid of Mammon; and often, in no lengthened process of time, the accumulated bodies of the dead furnished pestilential emanations, diffusing sickness and death amongst those who congregated in their vicinity. Thus also sleek hypocrisy, in the garb of sanctity, lured its victims within the sphere of infection, thereby increasing the rate of mortality, and at the same time augmenting its revenues, by swelling the general mass of animal corruption, and multiplying the sources of infection. I have shown elsewhere (see articles Endemic and Epidemic Influences and Infection) that the accumulation of human exuviæ, and the interment of the dead amongst the living, and in places of frequent public resort, occasion, in the course of ages, a state of the soil which is most productive of noxious emanations, especially under the influence of a hot sun, and a warm, stagnant, and humid atmosphere, and which, moreover, contaminates the water in the vicinity. Thus ancient cities have generated the sources of their own decay, which circumstances have retarded or accelerated, according as these sources have been counteracted, or augmented, by legislative measures either of a beneficial or of an injurious tendency.

PESTILENCE, CHOLERIC. — Synon. — *Pestilential Cholera, Pestilential Asphyxy, Asphyxia Pestilenta*, Author; — *Epidemic Cholera*, Auct. Var.; — *Spasmodic Cholera, Cholera spasmodica*, Auct. Var.; — *Epidemic Spasmodic Cholera*, Hawkins; — *Cholera asphyxia, Asiatic Cholera, Indian Cholera, Malignant Cholera*, various Authors; — *Convulsive Nervous Cholera*, Gray; — *Hyperanthraxis*, Clanny; —

Cholera Morbus, Cholera Epidemique, Cholera Asiatique, Fr.;—*Die Epidemische Cholera, Asiatische Cholera*, Germ.

CLASSIF.—II. CLASS, III. ORDER (*Author in Preface*).

4. DEFIN.—i. NOSOLOGICAL.—*Anxiety and oppression in the chest, epigastrium and præcordia; disturbance of the bowels, with nausea, faintness, giddiness, and depression of vital power; frequent ejections of an offensive fluid, resembling rice-water, from the bowels and stomach, followed by spasms, tremors, distress; a cold, clammy, purplish, and shrivelled state of the surface; coldness and rawness of the expired air; a sense of painful or burning heat at the epigastrium, with urgent thirst, and rapid disappearance of the pulse;—the distemper being often preceded by indigestion and diarrhœa, and frequently followed by febrile reaction, affecting chiefly the brain and abdominal organs.*

5. ii. PATHOLOGICAL.—*A discharge from the bowels and stomach of the watery portion of the blood; more or less complete paralysis of the lungs, and arrest of the changes effected by respiration on the blood, and of the hepatic and renal secretions; depression of the heart's action; the circulation of a thick, dark, or venous blood through the arteries, with congestion in the large veins, and imperfect circulation through the capillaries, owing to the thick glutinous state of the blood; the congestion of the viscera in many cases being followed by an obscure or asthenic reaction, affecting chiefly the encephalon and abdominal viscera.*

6. I. INTRODUCTORY REMARKS.—Circumstances had induced the author to pay more than ordinary attention to the nature and progress of the pestilential cholera, from its irruption in Bengal to the present time. He had perused, with the utmost care, much of what has been published respecting it; and an opportunity had been afforded him of examining the reports and documents relating to it sent, from 1817 till 1827, by the medical boards and superintending surgeons of the three Indian Presidencies, to the Board of Directors of the East India Company. He had frequent opportunities of observing and treating cases of the malady in this country; and of examining the bodies of the dead. During these inquiries, he was particularly struck by some important facts, respecting which he conceived that much misapprehension and error were entertained and widely disseminated, and which required refutation. The *first* of these is connected with the origin and nature of the distemper. Many supposed it to be the common spasmodic cholera of warm climates, in an epidemic form merely, an opinion entertained by able writers, both in this country and on the continent, until they had opportunities of witnessing it. This opinion was, however, opposed to the author's experience of the forms of cholera met with in warm and insalubrious countries, between which and the recent pestilence there is a very marked distinction; and it was contrary to the belief of the oldest European residents in India, and of the natives themselves, who might have been supposed to know something of the usual manifestations of cholera amongst them, unbiassed by preconceived notions, or by medical system and authority. Instead of looking upon it as an aggravated form of cholera, they regarded it, wherever it broke out, as an unheard-of pestilence and scourge; and at its appearance whole villages and towns were deserted in consternation, to escape its infection; whilst the greater part of the English practitioners, having been taught to consider cholera to consist of purging, vomiting, and spasms of the lower extremities, and finding these symptoms present in the distemper they were called to treat, believed it to be that disease merely, in an aggravated form, without taking into consideration much more important phenomena uniformly presented by it, and without sufficiently adverting to the fact that these symptoms are often slight, or nearly altogether wanting in the most severe cases.

7. So strongly was the author struck by this misapprehension, that in the beginning of 1822, when editor of the Medical Repository, after noticing various facts connected with the disease, he observed:—"A careful review of the symptoms of this disease convinces us that the deranged actions which take place in the system during its continuance, are no more those to which the term cholera morbus ought to be applied, than they are those belonging to fever. It appears that this malady is the result of a peculiar cause which impresses the vital energies of the system in such a manner as to subvert the power of reaction in many cases, and to render it imperfect and unavailing in others, without the assistance of art. The cause of the disease seems to act as a poison on the extensive surface of the bronchiæ and air-cells, when the system is most liable to its attack; and, in many instances, it appears to destroy its victim in a few hours." (*Lond. Med. Reposit.*, vol. xvii. p. 407.)

8. That the author's opinion was neither prematurely advanced, nor inaccurate, has been shown by the subsequent researches of the most eminent observers. He had treated many cases of spasmodic cholera in a warm and most insalubrious climate, and had experienced the disease most severely in his own person; and while he recognised in these cases the accurate description of PAISLEY, CURTIS, GIRDLESTONE, and Dr. JAMES JOHNSON, he never met with, in any of them, the pathognomonic symptoms of the late pestilence. In this opinion he is borne out by the experience of every well-informed and candid observer, who has seen the disease in this country; and who will readily concede that it is altogether distinct from the severe forms of common cholera. (See art. CHOLERA.)

9. The *second* error, which has been extensively propagated both in this country and abroad, is, that the malady never exhibited any proofs of infection in the East. Knowing, however, from the best sources of information, that this statement is erroneous, the author has gone fully into the refutation of it, and has shown that much mischief has resulted from this opinion, and from the fact that, although evidence of its infection was everywhere furnished in India, no means of limiting the extension of the pestilence,—no sanitary measures were adopted in our Indian empire. That the distemper should extend less rapidly there, and exhibit its infectious property in a less remarkable manner than in Europe, was to be expected from free ventilation, and other circumstances tending to diminish the chances of infection, particularly amongst Europeans in warm climates.

10. A *third* error very generally entertained, both on the appearance of the distemper, and in

the present day, is, that it is caused by some unknown constitution of the air. But we have no instance on record of an epidemic of nearly thirty years' duration, without any interruption, unconnected with infection. Although the author admits that the pestilence is greatly aggravated by certain states of the air, to which the term epidemic is strictly applicable, notwithstanding our ignorance of the precise nature of these states, yet there seems no doubt that it is propagated, and prevails to a certain extent, independently of an epidemic concurrent influence. We know that some diseases are simply infectious without being epidemic, that others are both infectious and epidemic, and others are epidemic, and only contingently infectious. But the author believes that, like eruptive and typhoid fevers, this distemper is infectious, is not essentially epidemic, although it will, during favourable states of the atmosphere, &c., assume epidemic characters, and be modified accordingly. An attentive review of the various manifestations of the malady in India, throughout Asia, in Europe, and in America, seems to justify this view, and to confirm the conclusion as to its being a specific disease, arising from a specific cause, but promoted and disseminated more widely by the aid of various concurrent causes, amongst which epidemic, or unhealthy constitutions of the air; dirty, crowded, and close apartments; and crowding of the sick, are the most prominent.

11. II. PROGRESS AND MORTALITY.—i. *Progress.* Pestilential cholera first made its appearance in Jessore, a populous town in the centre of the Delta of the Ganges, and cut off the majority of those whom it attacked. It spread from the town in all directions, and reached Jaulnah, on the Madras side of the Indian peninsula, in June, 1818, and Bombay in August of the same year. It continued to spread and to prevail throughout all parts of India and the adjoining countries, and still prevails in many districts, although in various degrees of severity, and with intervals of complete immunity from its presence. Indeed, it may be said to have become naturalised in India, forming one of the diseases of the country.

12. During 1818, it visited, in an easterly direction, the Burmese empire, the kingdom of Arracan, and the peninsula of Malacca. In 1819, it appeared in the isle of Penang, in Sumatra, Singapore, the kingdom of Siam, Ceylon, and the isles of France and Bourbon. During 1820, it reached Tonquin, Cambogia, Cochin-China, Southern China, Canton, the Philippines, &c. In 1821, it visited Java, Bantam, Madura, Borneo, and numerous other places in the Indian Archipelago. In the years 1822, 1823, and 1824, it appeared at Tonquin, Pekin, Central and Northern China, the Moluccas, Amboyna, Macassar, Assam, and various other Eastern countries and islands. During 1827, it prevailed in Chinese Tartary. In all these countries and places its prevalence and fatality were unprecedented in medical history.

13. In July, 1821, it reached, in its western course, Muscat in Arabia, and, during the remainder of the year, visited various places in the Persian Gulf. In the following month it appeared in Persia, and during 1822 and 1823, 1829 and 1830, it prevailed in several of the principal cities of that empire. It broke out in Bussorah and Bagdad in July, 1821, and in 1822 and 1823 ravaged most of the populous cities of Mesopotamia, Syria, and Judea.

14. In 1822, it reached to within 150 miles of the Georgian frontiers of Russia, and in 1823 appeared at Orenburg and Astrachan, beyond which it seems not to have extended until August, 1828 and 1829, when it reappeared at Orenburg, the capital of the province of that name, situated on the Tartar frontier, about 400 miles north of the Caspian, and about 1000 miles north of the places where it prevailed extensively in 1822. Its prevalence and fatality in this province were great, upwards of a tenth of the inhabitants having been seized, and about a fourth part of those attacked having died of it. At the same time that the disease appeared in Orenburg, it was raging in several Persian provinces and Tartar tribes in Central Asia, from which it was supposed to have been introduced into Orenburg. At the commencement of 1830, the disease had entirely ceased in the Russian dominions; but, towards the beginning of autumn, it broke out with increased violence on the Georgian frontier of Persia, having appeared, in June, in the Persian province of Ghilan, on the southern shore of the Caspian, from the various southern ports of which it extended northwards along the westward Caspian shore until it reached Baku, Tiflis, Astrachan, and numerous other towns in its progress into the heart of the Russian empire. After attacking a number of places it has continued to spread westward and northward through Russia, Poland, Moldavia, and Austria; visiting Moscow, Warsaw, and other places in Poland, and extending, in May, 1831, to Riga and Dantzic, and in June and July to St. Petersburgh and Cronstadt; early in October to Berlin and Vienna, and subsequently to Hamburg, &c.

15. The distemper appeared for the second time in Astrachan near the end of July, 1830; and before the end of August, upwards of 4000 persons died of it in the city, and 21,270 in the province. After ascending the Volga it reached Moscow, became prevalent there at the end of September, and continued till February, 1831. It attacked about 9000 persons in this city, of which number more than one-half died. It reached Riga in the middle of May, and St. Petersburgh on the 26th of June. From Astrachan it extended to the northern coast of the Black Sea, and in the course of the rivers into the central parts of Russia. It reached Poland in January, 1831, followed the Russian army, in the subjugation of that country, and proved destructive in Warsaw and many other places, during April and May. At the end of the latter month it appeared in Dantzig. In June it prevailed in Lemberg, Cracow, and other adjoining parts, extending through Gallicia and Hungary, and reaching Berlin and Hamburg in August and September, and Vienna in the same months. It appeared at Smyrna in September, and soon afterwards in Constantinople. The pestilence was conveyed by a caravan from Mecca to Cairo in August, 1831, some thousands having died on the road, and by the middle of September, 10,400 Mahommedans, besides Jews and Christians, had died of it in this latter city.

16. Pestilential cholera appeared in England on the 26th of October, 1831, at Sunderland, a month afterwards at Newcastle-upon-Tyne, and in De-

cember at Hetton, Houghton-le-Spring, North Shields, Tynemouth, South Shields, Gateshead, and other places. The first cases reported in London occurred on the 13th or 14th of February, in the immediate vicinity of the shipping. In Scotland the pestilence first appeared at Haddington about Christmas, 1831, and in Leith and Edinburgh about the 22d of January following. Although instances were adduced of sailors belonging to ships which had arrived from Riga, Cronstadt, Hamburg, and Dantzig, and on board which individuals had died of the malady on the passage, being those first affected at the sea-ports in the north of England, still there is every reason to believe, from the information given me by several captains of ships who had left these foreign ports during the period when the distemper was prevailing there, that the infection was conveyed to many places in both England and Scotland in the clothes and bedding belonging to sailors who had died either in these foreign ports, or on the passage of the ships back to this country, the clothes and bedding of the sick and dead having been preserved without any purification, and given up to the relatives.

17. From this country the pestilence was conveyed in an emigrant ship, across the Atlantic to Quebec, many of the emigrants having died of it on the passage. It appeared at Quebec on the 8th of June, 1832, and on the 10th at Montreal; and thence it extended to Kingston on Lake Ontario and all the surrounding parts. New York was attacked by it on the 24th of June, and Albany on the 3d of July. About the middle and end of July it spread to Newcastle on the Delaware, to Philadelphia and several other cities, and thence to nearly all North and South America. It appeared at the Havannah in February, 1833.

18. The pestilence appeared at Calais on the 12th of March, and was believed to have been brought from England. On the 26th it broke out in Paris, where it carried off about 20,000 persons by the end of September, no precautions having been taken to prevent its extension, a general belief of its non-infectious nature having been erroneously entertained. During 1833 and the early part of 1834 it raged throughout Spain, and was very destructive in Madrid. It visited several parts bordering on the Mediterranean in 1834; and reappeared in London and in some other places in this country, as well as in North America, in the same year. It was most destructive in Rome in 1837, the number of deaths varying, for many days, from 200 to 300 daily. It spread to various other countries not mentioned in this brief sketch, between the years 1831 and 1837; and few places were entirely exempted from it, excepting those which were placed under strict quarantine. It still prevails (1845) in several parts of the East Indies.

19. ii. *The prevalence* of this pestilence and the *mortality* amongst those attacked, varied remarkably in different localities, and in different races of the species: and were variously estimated by different writers. The mortality, as well as liability to attack, was certainly greatest among the poor and ill-fed; and among the dark races and those presenting the lower grades of constitutional power, and of vital resistance to depressing agencies. The proportion of attacks to the population, and fatal cases in the whole number of attacked, were differently estimated, according as those cases which consisted chiefly of diarrhœa, or of the incipient stage, were comprised in, or entirely left out of, the account. Owing to these circumstances, nothing can be stated with any precision as to this point. In Arabia, one-third of the inhabitants of the towns which this pestilence visited was said to have died of it. In Siam, Java, and the Mauritius, the number seized was extremely great, as well as the mortality. In China, its fatality was still greater, especially in the more densely inhabited places, owing chiefly to the neglect of precautionary measures. In Persia, one sixth of the population of the principal cities and towns was cut off by it; and from one-fourth to one-third of the population of Mesopotamia was said to have perished. In Bassorah and Bagdad, situate in unhealthy localities, and in a humid atmosphere, a third of the inhabitants was carried off by it in little more than a month. At Erivan and Tauris it destroyed about one-fifth of the population. But in more elevated and healthy situations it was much less fatal. In Syria its ravages were extremely varied: in some places one-half of the inhabitants were swept away, whilst in others, as in Tripoli, only one perished out of every 200. During the prevalence of the pestilence in the southern and eastern provinces of Russia in 1830, the mortality was also various. At Tiflis three fourths of the sick, at Astrachan two-thirds, were carried off. Out of 16,000 attacked in the province of the Caucasus, 10,000 died; at Moscow one-half, and at Orenberg one-fifth only perished. According to the author last quoted, out of 54,000 and upwards attacked in the provinces of Russia, in 1830, more than 31,000 died. In Hungary alone, about 400,000 persons were said to have been seized, and more than half the number to have died.

20. In Astrachan one-third of the cases were said to have been fatal; among the Don Cossacks two-thirds. At Moscow the mortality varied greatly; being at first so high as nine-tenths of the cases, and afterwards sunk gradually to a third. When the disease first appeared in India, the mortality was also extremely high; but its prevalence, as well as its fatality, gradually abated after 1821. Exceptions, however, to this amelioration presented themselves in various places; and at the same period, when the rate of mortality did not rise above 8 or 10 per cent. in some parts, from one-fourth to two-thirds of the persons seized by it died in other places.

21. Of the prevalence and mortality of the distemper in this country, Dr. W. MERRIMAN has furnished the following table from the Reports sent to the Privy Council Office. It must have been evident, however, to all who paid attention to the matter at the time, that the reports were not even approximations to correct statements; for, to my own knowledge, several deaths from the disease in my own neighbourhood occurred without having been reported as such, and very numerous cases were treated successfully during the early or premonitory stage, which were either not viewed as cases of the malady, or not returned as such. The *prevalence* and *rate of mortality*, as far as my own observation enabled me to judge, were remarkably increased by previous ill health, by debility, and by advanced age. The number of cases which occurred before puberty was very small; and

from that age to thirty, the proportion of recoveries was greatest. From forty to fifty the proportion of deaths increased remarkably, and after fifty years of age but few recovered. But much appeared to depend upon the violence of the attack at the beginning.

	Cases.	Deaths.	Recoveries.	Population of Places affected.
England	49,594	14,807	33,790	2,753,958
London	11,020	5,273	5,745	1,424,896
Wales	1,436	498	938	101,603
Ireland up to March, 1833.	54,552	21,171	33,381	

22. III. DESCRIPTION OF PESTILENTIAL CHOLERA.—The nature of this pestilence is best inferred from a faithful history of the phenomena manifested by it during its progress, and of the changes it produces in the organisation, and from the means found successful in limiting its extension, and in restoring the frame to its healthy state when subjected to its attack. In conducting an inquiry into the phenomena and nature of this pestilence, I shall confine myself to the more important topics of the subject, and endeavour to arrive at inferences founded on careful observation and extensive experience.

23. Since the first irruption of the malady in the Delta of the Ganges, during its various manifestations in India and other parts of Asia, and in its different visitations of northern and western countries,—whether observed in British India, in Siam, Java, and the adjoining islands,—in China, in Tartary, in Arabia, Persia, Syria, or in Russia, England and other countries of Europe, or in America,—whether attacking the Hindoo, the Mussulman, the Malay, the Mongul, the Asiatic, Caucasian, or the European branches of this race, the characteristic features of the disease have been uniformly the same,—modifications as respects grade, or intensity of attack, and as regards the severity and the occurrence of the consecutive fever, being the chief sources of distinction. Age, constitution, and varying degrees of predisposition, frequently occasion different manifestations of certain functions, or peculiar forms of disturbance, yet still the principal phenomena continue but little modified excepting in degree; and it is not until consecutive changes are induced in the system by the morbid actions characterising the disease, that any marked difference manifests itself,—such difference evidently proceeding from pre-existing states of the internal viscera, innate vigour of constitution, and the remedial means employed to remove the attack. This uniform character of the malady indicates a specific cause, with which, however, several others may combine, favouring its action, by disposing the frame to its invasion, by reinforcing its activity, or calling it into operation after the body has been exposed to its influence.

24. The specific cause producing the disease may be supposed not only to be thus reinforced by other causes, some of them of no mean influence, but itself may vary considerably in intensity, producing, *cæteris paribus*, effects of coordinate severity, yet still acting with a certain relation to the predisposition of the individuals exposed to it. This may be more clearly illustrated by taking for granted the operation of a certain infectious product or poison, the existence of which will be shown in the sequel. This product or effluvium emanating from the bodies of those attacked with the disease, often in a form rendered manifest to the senses of the observer, necessarily varies as respects concentration and quantity, dilution in the air, and rapidity of dissipation by means of ventilation; its effects, therefore, may reasonably be supposed to vary equally in grade, the state of predisposition to become affected by it being the same. Where, however, the predisposition is great, as after great fatigue, during mental depression, &c., a less concentrated and abundant effluvium proceeding from the affected, will produce a more intense effect than this principle in its most active and concentrated form, acting upon a person but slightly predisposed: whilst this intensity of cause will altogether fail of producing any marked effect in the strong, the unpredisposed, or the person whose moral confidence and equanimity generally repel the invasion of any form of infection.

25. Thus, therefore, the manifestations of the malady will be modified chiefly in grade, and scarcely at all as respects its form. In these respects, the efficient cause of the disease is perfectly similar in its operation to the causes of other infectious diseases familiarly known, and frequently observed in an epidemic form;—when the poisonous emanation is concentrated and intense, the subject being also predisposed to its invasion, its effects are rapidly produced, remarkably severe, and speedily arrive at a termination. On the other hand, when weak or much diluted, or when the predisposition of the subject is slight, its operation is slow, and the train of morbid actions of longer duration and diminished severity. Thus I have seen a person struck down nearly inanimate, by the infectious effluvium proceeding from the bodies of the sick, and concentrated in a close apartment, and death following in a few hours, without the energies of life being rallied; and similar results have been often observed by others. Owing, therefore, to the intensity of the efficient cause of the disease, to the number of concomitant causes which may reinforce its action, and to the state of predisposition of those exposed to them, the modified results which I am now about to detail will present themselves.

26. i. *A. Symptoms.*—The *invading* or *preliminary symptoms* of the disease generally consist of pallor, and collapse of the countenance, with an expression of anxiety; slight pain of the forehead, noise in the ears, and vertigo; sickness, heat, and pain at the epigastrium; oppression at the chest, with frequent sighing; nervous agitation, remarkable loss of muscular power, general uneasiness; colicky pains in the abdomen, with slight diarrhœa, at first feculent, but afterwards watery or serous; sickness at stomach; slight cramps of the legs; oppressed, weak, small, slow or creeping, and sometimes intermitting pulse, and coldness, clamminess, or humidity of the surface. These symptoms are of varied duration—of one, two or even three days, sometimes of several hours only,

and at other times not of as many minutes. In some cases, they have been scarcely remarked, the patient having been struck down almost lifeless, with a dark or livid state of the surface, and all the symptoms characterising the fully-formed state of the disease.

27. Dr. SMITH observes, that several of those about to be attacked, may be seen with a peculiarly dark ring round their eyes; and others state that the features evidently collapse, and the expression becomes anxious for a day or two, or at least for hours, before they sicken. At Orenburg, dyspeptic symptoms are stated to have preceded its attack, and a similar observation has been made in other places. Various authors have said, that stomach and bowel complaints, of a less serious nature, often preceded a fully developed seizure for a day or two; and that these complaints have likewise occurred in the place where this pestilence has prevailed, and been removed by treatment, or disappeared spontaneously, without being followed by the fully developed distemper. This, indeed, agrees with my own experience, during the prevalence of the malady in London. For, although but comparatively few were carried off by the pestilence, yet very many experienced severe indigestion, flatulence, and diarrhœa, with marked vital depression, sometimes with slight spasms, these ailments being either removed by restorative and astringent medicines, or successfully resisted by the powers of the constitution. And I may add, that there were very few medical men who did not experience these symptoms in their own persons,—at least the dyspeptic symptoms, if not the diarrhœa,—during the period of their attendance on cases of the distemper.

28. *B.* The *fully-developed state* of the malady consists of great vertigo, nervous agitation, oppression at the chest and præcordia, with complete loss of muscular energy; cramps, commencing at the fingers and toes, and rapidly extending to the trunk; slow, thready, and weak pulse; great collapse of the countenance, the eyes being sunk deep in their sockets, and surrounded by a dark circle; vomiting and purging of a fluid resembling whey, or rice-water, containing whitish flocculi; a peculiar sharp and contracted state of the features, and wild and terrified expression of countenance, arising from a feeling of rapidly approaching dissolution. The whole surface, particularly the hands, face, and extremities, assumes a leaden, blue, or purplish tint, varying in shade with the intensity of the attack and complexion of the person; the extremities are shrunk, shrivelled, sodden, and the skin is deadly cold, damp, and raw to the touch; the nails assume a bluish-white hue; the pulse is either reduced to a minute thread, or is entirely lost at the wrist, and often can with difficulty be felt in the neck; the course of the large superficial veins is marked by flat lines of a darker tint than the adjoining surface; a burning heat and inexpressible anxiety is complained of at the epigastrium; the patient tosses about incessantly, from a feeling of intolerable weight and anguish round his heart; he struggles for breath, and often lays his hand on the stomach and chest, referring his agony chiefly to those situations; his voice is nearly gone, and his respiration is quick, irregular, most laborious, and imperfect; the inspiratory act being effected by an immense effort, and expiration being quick and convulsive. The patient calls frequently for cold water, speaks in a plaintive whisper, and utters only a word at a time, the lungs not containing air enough for a sentence. The tongue is always moist, often white and loaded, and generally flabby and cold. A thermometer introduced below the tongue indicates an animal temperature frequently of ten or twelve degrees below the standard of health. The sense of touch is generally greatly obscured, and deafness is often present. If blood be obtained in this state, it is black, flows by drops, is thick, and feels colder than natural; and the air which is expired is cold and raw. Vomiting and purging, which are far from being the most dangerous symptoms, and are often the most remarkable in the least urgent cases, are generally slight, or at least not profuse, in those attacks where the sinking of the vital energies is the most rapid and the greatest, or are readily allayed by medicine. The integuments of the abdomen are often raised into irregular folds, whilst the epigastrium and hypochondria, with the whole abdomen, are commonly, especially in the intensely severe cases, drawn inwards and upwards upon the chest. The spasms are generally of a more or less passive kind, but they sometimes, particularly in the loins, legs, and thighs, present a tetanic rigidity. They are often slight, or nearly absent, in some of the most rapidly fatal cases, or replaced by a constant tremor. There is occasionally a low whine of suffering expressed. The secretion of urine is totally suspended, as well as the biliary, the salivary, and lachrymal fluids; and a peculiar earthy odour issues from the body, with a singular fetor of the perspiration and evacuations.

29. These are the symptoms in the more severe attacks, varying, however, somewhat in degree, and with the occurrence or non-occurrence of previous diarrhœa. When the intense attack takes place without previous diarrhœa, then the vomiting and purging of watery or rice-coloured fluid,—from the escape of the watery portion of the blood from the digestive mucous surface,—are most marked; the quantity of this fluid thrown out, both upwards and downwards, in a few minutes, being often extremely great. If the remedial means succeed, the animal heat is slowly restored, the pulse becomes fuller, and the colour of the surface more natural; but if these means fail, rapid extinction of the functions takes place. Frictions even then may reduce the lividity of the part to which they are applied, but that of the face and hands increases. The lips and cheeks sometimes puff out in expiration as in apoplexy; and towards the close of the scene, the respiration often becomes slow, with a quivering of the tendons of the extremities. The mind is generally undisturbed, the patient feeling merely a certain degree of apathy towards the close, and a desire to be left to his fate. At last he is unable to swallow, he then becomes insensible, and he dies after one or two long convulsive sobs. In some cases, when the patient has been thus rapidly cut off, without any rallying of the energies of life, convulsive motions of the muscles have been remarked an hour or two, or even longer, after expiration had ceased.

30. Such is the history of the disease when it terminates life without any reaction of the nervous and muscular systems, the patient generally dying

in from six to twenty-four hours. But, both in the East and in Europe, particularly the latter, or amongst Europeans resident in India, a consecutive state of disease, attended with efforts at re-action of an imperfect or malignant character, was not unfrequently observed. It was rarely evinced in the weak Hindoo, or in the previously debilitated, of whatever race, but sometimes in the stronger or less predisposed in India, and often in Europe, and in England, especially in the robust and young.

31. From the aggravated state which has been now described but very few recover, particularly if that state have existed as long as three or four hours before active treatment has been resorted to. A thread of pulse, however small, is almost always felt at the wrist, where recovery from this state is to be expected. Hiccough coming on in the intermediate moments between the threatening of death and the beginning of re-action, is a favourable sign, and generally announces the return of circulation.

32. In less severe cases, the pulse is not wholly extinguished, though much reduced in volume: the respiration is less embarrassed; the oppression and anguish at the chest are not so overwhelming, although vomiting and purging and the cramps may have been more intense. The coldness and change of colour of the surface, the peculiar alteration of the voice, a greater or less degree of coldness of the tongue, the character of the liquids evacuated, are invariably well marked in all the degrees of violence of attack of this pestilence. In no case or stage of this disease have I observed shivering; nor have I heard, after inquiry, of more than one or two cases in which this febrile symptom took place.

33. *C.* The *consecutive phenomena* of this malady vary considerably. In the East, when recovery took place from the previous state, it was often rapid, and without much subsequent disease having been experienced. The numerous writers, however, in the Reports from the Medical Boards of the three Indian presidencies, make particular mention of a consecutive fever, characterised by nervous and malignant symptoms, such as I am about to enumerate, and which was very commonly observed to follow the attack in Europe. They also state that the malady often passed into visceral disease and dysentery; and that the danger was not over, although they succeeded in rallying the powers of life. According to Drs. BARRY and RUSSELL, after the blue or cold period has lasted from twelve to twenty-four, seldom to forty-eight hours or upwards, the pulse and external heat begin gradually to return; headache is complained of, with noise in the ears; the tongue becomes more loaded, redder at the tip and edges, and also drier. High-coloured urine is passed with pain, and in small quantities; occasionally is nearly or altogether suppressed; the pupil is often dilated; soreness is felt on pressure over the liver, stomach, and belly; and an offensive odour is exhaled from the surface; in short, the patient is now labouring under a continued malignant fever.

34. A profuse critical perspiration occasionally comes on from the second or third day, and leaves the patient convalescent; but more frequently the quickness of pulse and heat of skin continue; the tongue becomes brown and parched; the eyes suffused and drowsy, with a dull flush, stupor, and heaviness of the countenance, resembling typhus. Dark sordes collect about the teeth and lips; and sometimes the patient is pale, squalid, and low, with the pulse and heat below natural, but with the typhous stupor. The urine is suppressed. Delirium generally supervenes, and death takes place from the fourth to the eighth day, or even later, in the very person, too, whom the most assiduous exertions had barely saved in the cold stage. Dr. REIMER states, that of twenty cases treated under his own eye, who fell victims to the disease, seven died in the cold stage, and thirteen in the consecutive fever. This proportion nearly agrees with that observed in my own practice, or amongst the cases to which I was called. In two cases which I attended, most extensive erysipelas complicated the consecutive fever. I agree with the observation of Drs. BARRY and RUSSELL, that persons employed about cases in this typhoid stage, are never attacked with ordinary fever, but with a genuine cold, blue cholera.

35. In another class of cases, serious disorders of the secreting organs of the abdomen, particularly of the liver and of the digestive tube, supervene, instead of the low nervous fever now described. The evacuations from the bowels become of a dark, blackish, offensive, and highly irritating kind, and attended frequently with discharges of a bloody fluid, with mucus, and extremely urgent irritation of the rectum, the consecutive symptoms assuming nearly the character of dysentery. Sometimes an inflammatory, or sub-inflammatory state of the stomach and bowels takes place, either alone, or accompanied with great tenderness in the region of the liver, and disorder of the biliary secretion. In other cases these symptoms assume very nearly the form of bilious or gastric fever; and in a few this state of disease is associated with inflammatory congestion of the lungs. When these states of consecutive disease are severe, they not seldom carry off the patient; and where recovery takes place, are frequently accompanied with tedious convalescence.

36. *D.* The *points of difference* between the manifestations of this pestilence in India and in Europe, appear to be chiefly the following: — 1st. The precursory dyspepsia and diarrhœa appear not to have been so frequent in India, especially in dark races, as in Europe. 2d. The evacuations seem to have been more profuse and ungovernable in the violent attack, in the former than in the latter, although the characters of the evacuations were entirely the same. 3d. Restoration to health from the cold state, without passing through consecutive fever, was by far more frequent in India than in Europe, nor did the consecutive fever there so generally assume a typhoid type. 4th. The proportion of deaths in the cold, compared with those in the consecutive stage, was far greater in the former than in the latter country; and 5th. The proportion of medical men and hospital attendants attacked seemed greater in Europe than in the East. Relapses, also, in the hospital attendants were not unfrequent; whilst convalescence was generally perfect and rapid elsewhere. Mr. JAMESON states, in the Calcutta Reports, that, although relapses were not uncommon, there seemed to exist an

immunity from second attacks, but this is not fully ascertained.

37. It may, perhaps, be difficult to explain the frequency, and the modified state, of the consecutive disease now described, as it was observed in this country and throughout Europe. Much, perhaps, may be owing to the state of predisposition, the intensity of the cause, and the constitution of the affected: something also may be attributed to the effect of treatment in the early stage of the malady, particularly the more general employment of bloodletting and large doses of calomel,—means evidently calculated to remove the oppressive congestion of the vital organs, and re-animate the functions of the secreting organs and emunctories of the frame, but which seemed not to have been so generally, nor so decidedly, resorted to in Europe as in India. Something also may be imputed to the greater vital resistance made to the noxious influence exerted by the poisonous miasm causing the distemper upon the frame, by the European constitution, than by the more delicate constitution of the dark races.

38. ii. *The Prognostic Symptoms.*—*A.* Those symptoms which indicate a *favourable* termination of the disease are, increase of the firmness and fulness of the pulse; returning animal heat to the surface; a tonic character of the spasms, or active retchings; not very urgent feelings of heat and anxiety at the epigastrium and præcordia, or a diminution of these symptoms, and of the pressing desire for drink; the occurrence of hiccough; a more natural and a livelier state of the countenance and surface of the body; greater freedom of respiration, and a diminution of the rawness and coldness of the respired air; a free evacuation of the bowels, with the appearance of a return of the biliary secretion, and especially the evacuation of urine, and amelioration of the tremors, restlessness, and general distress. These generally indicate a decrease of danger in the early stage of the disease, and returning vascular reaction; but this state may proceed to a fatal issue with all the symptoms of congestive and adynamic continued fever.

39. Typhoid symptoms, such as low delirium, black sordes on the teeth and lips, dry, parched skin, &c., may, however, come on, and the patient sink. The non-accession of these symptoms; the occurrence of a copious, warm perspiration; the return of the natural secretions and evacuations,—as of the salivary, bilious, and urinary secretions; the absence of serious affections of any of the viscera contained in the abdomen, particularly of the liver, stomach, and bowels; and a return of the functions of the nervous, assimilating, circulating, and respiratory organs to their natural state, are the chief guides of the physician in forming a favourable prognosis.

40. *B.* On the other hand, an *unfavourable* issue must be looked for when the prostration of strength; the coldness and blueness of the surface; the sinking and irregularity of the heart's action; the collapse of the countenance; the coldness and rawness of the expired air; the oppression and difficulty of respiration; the anxiety and restlessness, &c., are great or, individually, extreme; and especially if, with great intensity of these phenomena, the retchings and spasms are slight; or the latter consist chiefly of tremors, or irregular clonic contractions. An oozing from the mouth of the fluids from the stomach, unconscious evacuations or relaxation of the sphincters, the breathing consisting of convulsive sobs or being stertorous, with puffing of the cheeks or lips, and inability to swallow, indicate approaching dissolution in the cold or early period of the disease.

41. The occurrence of low delirium, or of coma, with collapse of the countenance, and all the symptoms of malignant continued fever, consecutive of the cold stage, are extremely unfavourable, especially when attended by suppression of urine, by great stupor, dark sordes about the teeth or lips, by convulsive tremors of the tendons, and restlessness. These symptoms show that the congestion of the nervous centres, which occurred in the preceding periods of the disease, together with the thick and otherwise morbid state of the blood itself, has been followed by serious disturbance of the capillary circulation in the substance of the brain and of its membranes, probably conjoined either with effusion beneath or between the arachnoid membrane, or with continued congestion of the veins and sinuses of the encephalon. The continued suppression of urine is manifestly owing as much to the change produced in the blood, by the evacuation of the watery part of it by the bowels, as to a paralysed state of the kidneys.

42. The supervention also of tenderness, pain, &c. in the region of the liver, or in that of the stomach; a very morbid and irritating state of the alvine evacuations, with blackish, bloody, and mucous discharges, attended with tremors, &c., all indicate, respectively, the consecutive appearance of inflammation, or inflammatory congestion of the liver, of the stomach, and bowels (§ 46.), and evince a marked tendency to disorganisation, and call upon the practitioner for the employment of the most decided means of cure. Although these consecutive phenomena show a most serious state of disease, yet recovery will sometimes take place from it by the assistance of well-directed means.

43. iii. *Morbid appearances observed after death.* — The morbid changes observed after death from this pestilence are in every respect the same, both in Eastern and in European countries. When the cold stage proves fatal, or death takes place within four-and-twenty hours from the seizure, but little change of organisation can be detected, although the viscera are much altered in *appearance* from the healthy state. The surface of the body usually presents the same aspect as mentioned when describing the fully formed stage of the malady, being livid, corrugated, constricted, and humid. The lungs are commonly found collapsed, condensed, sometimes remarkably shrunk, and always loaded with black blood, of an oily or ropy consistence, and very closely resembling tar or treacle. The cavities of the heart are filled with a black blood, and they frequently contain polypous concretions. Blood of a similar appearance is generally found in the arch of the aorta and other large arteries. The blood-vessels of the brain and its membranes are more or less gorged with dark blood, particularly towards its base. The arachnoid membrane is frequently deprived of its transparency. A serous fluid of various quantity is often found effused between the convolutions of the brain, and in the lateral ventricles. Similar appearances to those detected in the cranium are also found in the vertebral column.

44. The abdomen, upon being opened, generally emits a peculiar offensive odour. The stomach and different parts of the bowels are frequently partially, but considerably contracted; at other places greatly distended with flatus: the internal surface of the stomach sometimes seems but little affected. A whitish or yellow fluid matter, resembling the evacuations, is often observed in different parts of the alimentary canal, which occasionally contain much air, but neither bile nor fæces. The internal surface of the intestines is commonly lined by a tenacious muco-albuminous matter. The colon is frequently much contracted, generally throughout. The mucous membrane and sub-mucous cellular tissue of the digestive canal present evident marks of congestion, in some cases approaching to a sub-inflammatory state, but generally in spots or patches of various sizes, the colour of these varying from a very dark venous congestion to a more roseate hue. Decided signs of inflammation are always wanting, even in the most remarkable of those congested states. The glands of BRUNNER and PEYER, as well as the solitary glands, are greatly enlarged. Both stomach and bowels are frequently of a paler colour than natural, both in their inner and outer surfaces. The liver is generally pretty full of dark-coloured blood; the gall-bladder often much distended with tenacious ropy bile, of a dark yellow or green colour. The gall-ducts are sometimes contracted, at other times not. The appearance of the pancreas, spleen, and kidneys is various, frequently differing but little from their natural state, in other cases somewhat gorged with blood. The urinary bladder is always contracted and empty. The vena porta and all the large abdominal veins are loaded with black blood, resembling tar.

45. The chief change observed in cases terminating fatally in the blue stage of the distemper, is in the *blood*, which has lost the greater part of its serum, which, as it has exuded from the digestive mucous surface, has left an albuminous coating over the mucous membrane, and that remaining congested, thick and treacle-like, in the large veins.

46. In cases the duration of which extends from one to three days, the same leading appearances as now described are observed, but often with considerable additions. The vessels of the stomach in these are found loaded with blood, presenting a surface sometimes of a pale pink hue, sometimes of a deep blue, at others of so dark a tint as to resemble sphacelus of the membrane, from which, however, it was readily distinguished by the firmness of the texture. Similar changes are found in the small intestines, and but very rarely in the larger. In many, evidence of congestive pneumonia is found, which is usually latent before death. In those cases in which coma occurs, serum is sometimes effused in larger quantities than already alluded to, but occasionally congestion only of a very black fluid or semi-fluid blood is found. Those who die of the consecutive disease show few appearances that are different from such as are usually observed in other cases, attended with corresponding symptoms. Those cases, which have evinced, during the secondary fever, marked disturbance of the brain, generally present after death greater vascularity of the substance of this organ and of the membranes than natural, with the congestion of blood in the veins and sinuses, and effusion into the ventricles and between the membranes, particularly between the pia mater and the arachnoid reflected over it. In some cases the brain seems dusky or mottled, and the veins turgid with dark semi-fluid blood. In those terminating fatally, with hepatic disturbances, the liver is generally of a dark brownish or sodden appearance. In some cases it is of a purplish black, somewhat enlarged, its veins filled with dark semi-fluid blood, and the ramifications of the hepatic duct loaded with a dark green or greenish yellow bile. The stomach and bowels, particularly the latter, are contracted and thickened, the inner surface softened, of a dark red or purplish colour, in patches or streaks; sometimes excoriated, partially detached from the muscular coat, and covered with a muco-sanguineous fluid, in those who have died with consecutive gastro-enteric or dysenteric symptoms.

47. IV. DIAGNOSTIC CHARACTERS.—Much misapprehension of its nature and origin has arisen from viewing the pestilential cholera merely as a modification of, if not identical with, the form of cholera not unfrequently met with in India and other warm climates, and occasionally in this country, to which the terms *spasmodic cholera* and *mort de chien* have been applied. Many writers, particularly those who argue against its infectious nature, have considered this pestilence merely an epidemical occurrence of that form of cholera. It is true that, in the spasmodic cholera, the secretion of bile is either altogether or nearly interrupted; or, if it be at all discharged into the bowels, that it is so vitiated as to prove extremely irritating to their internal surface, the spasms, retchings, alvine evacuations chiefly arising from intense irritation of the organic nerves supplying the digestive tubes and the abdominal viscera, together with accompanying congestion of these vessels. In that disease, there is every reason to suppose that the absence of bile is to be imputed to spasm of the common bile duct, rather than to a suppression of the secreting and excreting functions,—whilst, in pestilential cholera, these functions are altogether arrested, and the discharge of bile is interrupted, independently even of any spasm of the excreting ducts,—the biliary secretion being suspended as well as the urinary, owing not only to a paralysed state of the liver and kidneys, but also to the state of the blood being such as not to admit of circulation through the extreme capillaries, and to the loss of its serum.

48. In the spasmodic, or severe form of sporadic cholera, the discharges from the stomach and bowels are certainly either not coloured by bile, or but little, excepting at the commencement, and when the disease begins to yield; but they are accompanied with a different train of symptoms. The spasms are more tonic, and confined more to the muscles of the abdomen and of the thighs and legs, than in the pestilential disease; and, in the former, the vertigo, deafness, headache, marked affection of the respiratory function and of the circulation, characterising the latter, are entirely wanting.

49. In sporadic or bilious cholera, the very dark, thick, and ropy appearance of the blood; the cold, wet, and shrivelled state of the surface, and its leaden, dark, or purplish colour; the almost total absence of pulse at the wrist; the very marked and

rapidly increasing collapse of the powers of life; the disagreeable and earthy odour of the body, even during the life of the patient; the burning sensation between the scrobiculus cordis and umbilicus; the complete arrest of the glandular secretions; the cold tongue and mouth; and the coldness of the respired air, which characterise the pestilential disease, are entirely absent.

50. In one, the powers of life are certainly very much deranged, and the circulation and functions of the internal organs greatly disturbed; but in the other, all the derangements and their attendant symptoms are of a much more alarming and malignant nature; the balance of the circulation is much more completely overturned, the circulating fluid itself much more sensibly and seriously diseased; the respiratory functions infinitely more disturbed; the spasms of the voluntary muscles more general, and more clonic as respects their nature; the purging and vomiting slighter and of shorter duration, and forming a less prominent feature of disease; the surface of the body more deprived of its vitality, of a much darker colour, and more collapsed and shrunk; and the powers of life are more completely overwhelmed, and sooner sink altogether, than in the severest forms of cholera observed to occur occasionally in warm climates, or in temperate countries, under circumstances favourable to their appearance.

51. In this pestilential malady, the powers of life are insufficient of themselves, even although assisted by the administration of stimulants, to overcome the congestion of the internal organs, and restore the circulation in the surface of the body and in the extremities; and while the large secreting viscera in the abdomen remain engorged by the thick and viscid blood thrown in upon them from the external surface, and their vital powers overwhelmed, their functions of secretion must necessarily be arrested; and thus they are unable to remove the load oppressing them, by one of the modes in which congestion of secreting organs is usually overcome.

52. In the severer forms of cholera, occurring sporadically, the derangements, being less malignant than in the present malady, are more readily removed by an energetic and appropriate treatment. Here the exhibition of large doses of calomel, opium, and stimulants, is generally sufficient to allay the inordinate action of the stomach and bowels, to restore the balance of the circulation, to remove spasm, and to excite the secreting function of the liver. But in this pestilence, the lungs are completely paralysed, the changes produced by respiration entirely suppressed, the blood is thick and vitiated, the large vessels, particularly the large venous trunks, and the cavities of the heart, are so engorged with blood as to be unable, particularly in their state of deficient vital energy, to react upon the distending fluid, and to throw it, particularly in its state of morbid density and tenacity, into the extreme vessels of the secreting organs and external surface, unless internal and external stimulants of the most powerful kind be employed; and even these are very often inadequate, of themselves, to fulfil the intention with which they are employed, and occasionally are productive of mischief, unless the engorgement of the internal viscera be early removed by vascular depletion and external medication, which, while they relieve the heart and empty the large vessels, enable them to react upon their contents, and recall the flow of blood from the centre to the circumference of the frame. Hence it is generally indispensable, in this very formidable disease, to exhibit stimulants and antispasmodics internally, with artificial heat and stimulating frictions, in order to rouse the vital energy of the system, whilst we remove the vascular load by means of emetics and evacuations of blood, and afterwards endeavour to excite the functions of the liver, and restore the secretions generally.

53. Amongst the other characteristics intimately connected with the nature of this pestilence, and calculated to distinguish it from all those states of disease to which the term cholera has been usually applied, may be particularly noticed the prevalence of the pestilence in all seasons, countries, and climates; the affection of the head, nervous system, and respiratory organs, characterising the commencement of its attack; the uncommon and sudden diminution of the animal temperature, which often sinks below the heat of the surrounding air, both on the surface of the body and in more internal parts; the remarkably sudden and rapid depression of the powers of life; the continued restlessness and distress referred to the præcordia and epigastrium; the mental apathy and indifference to the result; the vertigo, stupor, and deafness; the blue colour and shrunk appearance of the surface of the body; the state of the respiratory actions, and peculiar groan or whine of the affected; the unquenchable thirst, and burning at the epigastrium; the sodden, raw, wet, and shrunk state of the surface; the rapid exudation of a watery fluid from the skin, and digestive mucous surface; the states of disease by which it is very frequently followed; the unprecedented mortality, notwithstanding the most energetic and judicious treatment, and the use of those means by the aid of which nearly all the cases, even of the most severe forms of intertropical cholera, generally recover; and, lastly, the appearances observed after death, particularly the collapsed state of the lungs, the blackness of the blood, the fibrinous concretions in the cavities of the heart, the morbid secretion lining the internal surface of the intestines, the flaccidity of all the soft solids and of the substance of the heart itself, and the congestion of black blood on the large nervous centres. (See § 43, *et seq.*)

54. The *secondary fever and consecutive phenomena* (33.), which follow upon the cold and blue stage of the malady, also furnish remarkable proofs of dissimilarity between this pestilence and the severe forms of cholera observed in hot countries, or in temperate climates after very hot and moist seasons. After these latter the patient recovers without any consecutive disease, and frequently the tumult of the frame leaves it benefited by the changes it induces; but, in the present pestilence, the consecutive states of disease are as dangerous as the blue stage; and, even when assuming a typhoid or febrile character, they do not communicate a febrile disease, but the distinct and specific pestilence now treated of. This important feature was happily insisted upon in the Reports of DRS. BARRY and RUSSELL; and is one of itself sufficient to distinguish this pestilence from every form of cholera.

55. Various attempts have been made to trace a resemblance between this disease and some of those which have occurred in former ages, and of which very imperfect accounts have been furnished by writers; but, upon referring to the meagre details which have been given of them, I am unable to trace any close resemblance between them—far less identity. Mr. ORTON has endeavoured to find out a very close similarity between this pestilence and that which ravaged England and some parts of Europe at various periods, between the years 1483 and 1551, and which obtained the name *Sudor Anglicanus, Ephemera maligna sudatoria*, and *Sweating sickness*. In certain phenomena the similarity is close, but in others altogether wanting; but as it cannot lead to any practical results, I will not further pursue the subject.

56. It may be important, however, to be aware, that poisoning from acrid and narcotic substances, and particularly tobacco, or those belonging to the class of animal poisons, occasions symptoms which, in many respects, closely resemble those characterising this pestilence. But the difference will be apparent upon inquiry into the history and premonitory symptoms of the attack, and by observing the collapsed, shrunk, dark, and wet state of the surface of the body; the sodden, shrivelled, damp, and raw state of the extremities; the spasms, the oppressed respiration, the sunk appearance of the epigastrium, and of the hypochondria; the peculiar character of the matters ejected; the cold, raw state of the expired air, and the black, viscous condition of the blood, all of which characterise this pestilence, and are either altogether absent from every other kind of attack, or never similarly associated.

57. After attentively considering its phenomena and nature, I would conclude,—1st, that this malady, as respects the causes which occasion it, and as regards the pathological states which constitute its various grades or stages of intensity, is quite distinct from all the forms of cholera, whether the common *bilious* variety, or the more severe form, usually denominated *spasmodic*, the *mort de chien*, &c.; and that, therefore, the name cholera should be discarded from all scientific descriptions of it.

58. 2nd, that the accounts which we possess of the epidemics and pestilences which have ravaged various countries in former times, do not furnish us with the history of any disease which may be considered as identical in its nature with this pestilence; and that it must, owing to this circumstance, and to the uniformity of its characteristic phenomena, be viewed as being of modern origin, and *sui generis*.

59. As it is important that the name of a disease should not be such as may risk its being confounded with another, different from it in its nature, symptoms, and termination, so I consider that some other name than that at present applied to it should be given it. As to the particular appellation which may be employed, I conceive that one pointing to its chief pathological states, and its prominent tendencies, ought to be preferred. The intense influence of its exciting cause upon all the respiratory actions and functions, as well as upon the actions of the heart and state of the pulse, and its marked tendency to propagate itself, and to terminate fatally, have induced me to apply to it the name of *Asphyxia pestilenta*, or *pestilential asphyxy*.

60. V. CAUSES AND NATURE OF PESTILENTIAL CHOLERA.—There are few subjects which have given rise to greater diversity of opinion, or to more discussion, than the causes of this disease. Suppositions have been adduced, and reasoned from, as established and admitted facts; and repeatedly observed occurrences and corroborated evidence have been explained away or denied, even by those who have given us merely vague hypotheses and chimerical speculations in their place. It must be evident that but little truly important can be stated in respect of the causes and nature of this malady, without previously inquiring into, and coming to some conclusion as to its infectious or non-infectious nature. I shall, therefore, inquire, in the *first* place, into the evidence which has been adduced as to its possessing an infectious property from its commencement in Jessore, and as to the extent and character of this property. Its predisposing and concomitant causes will *next* come under consideration; and, *lastly*, various topics connected with its nature will be discussed.

61. i. *The infectious nature of pestilential cholera demonstrated.* The infectious or non-infectious nature of this disease is one of the most important topics to which public attention can be directed; and one which, owing to the manner of viewing it, adopted both in this country and on the continent, requires the serious consideration of the informed part of the community. Knowing that much important information had been furnished by the medical observers of the disease in India, which was entirely overlooked, I carefully examined the reports to the Medical Boards of the three Indian Presidencies. I had also an opportunity of referring to the medical reports at the India House. From those sources, therefore, and from others within my reach, I can state that much misapprehension of this terrible disease had gone abroad, and been propagated by authorities that should have been more accurately informed on the subject. I can truly state that, although my attention has been much engaged by this disease, since the time of its eruption in the Delta of the Ganges, I approached this topic with my mind entirely unbiassed, and desirous of adopting that view of it, which well-ascertained facts should most fully support. When, therefore, professional authorities have stated opinions which have misled, and will still further mislead, those who have it not in their power to detect their unsoundness, it becomes the duty of those who have detected the true character of these opinions to place the particulars within the reach of the misinformed. One able writer remarks as an acknowledged and proved fact, "that by an overwhelming majority of the British medical officers, who have witnessed epidemic cholera in the East Indies, this disease is not considered to be of a contagious or infectious nature. A few incidents occurred which excited suspicions in the observers, that it might really, after all, possess this property. But scarcely a single person has advocated the doctrine of contagion with any earnestness." The same writer afterwards stated, that "the almost unanimous and earnest recommendation of British practitioners was not to consider the cholera contagious." In

another country an eminent physician, in an elaborate memoir on the disease, read very recently before the "Académie Royale de Médecine" of Paris, states, as a well-ascertained matter, "that in India the medical men and attendants on the sick were not more frequently seized by the disease than others of the community." Other instances of gross misstatement, made both by foreign and British writers, may be adduced, but these will suffice. Now, when we turn to the great authorities on the subject—to the official depositories of the origin and rise of this pestilence, we find that all the reports—the Bombay, the Madras, and the Calcutta, favour the infectious nature of the disease more or less. It is true that a majority of the surgeons and assistant-surgeons in India, who sent reports to their respective medical boards, state that they do not believe the disease infectious; but a large number of them give a very different opinion, whilst the reasons assigned by many for believing the disease to result from other causes than infection, are actually favourable to the existence of an infectious property. Even where they have argued against its infectious nature, they have often adduced the strongest evidence, although unconsciously, of its possessing this property.

62. When I entered upon the present inquiry, and commenced with the reports from the three Presidencies, in the order of their appearance, and before I had seen the disease in this country, I had not completely made up my mind on the subject of its infectious nature. But in order to come to a just conclusion, I had recourse to the earliest and the best information, and read and noted every individual report which these bulky publications contained: and so far are the remarks just quoted wide of the truth—so far are the medical men of India nearly unanimously against the belief in cholera possessing an infectious property, that the members of the Medical Board of Bombay, in the preface to the reports sent to them, and published at Bombay in 1819, state, that the disease had extended from Poonah to Panwell, a considerable village in the main line of communication between Poonah and Bombay; that a man who had left Panwell and arrived at Bombay, a distance of about fifteen miles, was soon afterwards attacked by the disease, and communicated it to those attending him; that it was traced in parts adjoining Bombay, and on the Island, from village to village, by the arrival of persons affected with it from places where it was known to prevail; and that there were places which, from want of this sort of communication, had, up to the time of the report, entirely escaped. From the foregoing and other data, the members of the Bombay Board—the first to furnish information respecting the disease—conclude that—"It appears to them incontrovertible, that this disease is capable of being transported from one place to another, as in cases of ordinary contagion or infection, and also to possess the power of propagating itself by the same means that acknowledged contagions do, that is, by the acquisition of fresh materials with which to assimilate." (*Bombay Reports, &c.*, pp. 10, 11.) In the same reports we find Captain SYKES stating that he ascertained that the disease did not break out in any village "until that village had communication with a neighbouring place in which the disease existed;" and he furnishes several instances proving this fact. Besides, he states that the attendants on those first seized in his company were attacked, and that it spread from one of his servants to five, whilst the gentlemen in the next tent had not one affected; and he remarks that he could add similar instances to those now adduced. (*Op. Cit.* p. 118.) Mr. COATS, surgeon, in a letter to the president of the Bombay Medical Board, states, that the idea most prevalent was, that the disease was brought from Jaulna to Aurungabad, and hat its progress could be traced distinctly through the villages on the chief road from Nagpore to those places, (p. 145.). He afterwards states, that the information as to the extension of the disease by infection was not only furnished by Europeans, but that some Brahmins had given similar information, without any particular inquiry on the subject having been made of them. From these and other facts, he concludes by considering the disease infectious; and that, "If it was occasioned merely by a distempered state of the air, it would have spread over the country with some regularity, but the epidemic seems generally to have travelled in lines along the post roads, and always to have required a succession of subjects for its propagation. In Candeish, where there is not sufficient population and but little intercourse between the villages, its progress was slow. At Pundergoor it made its appearance at the time of the great Jatra, and was spread at once in all directions by the pilgrims returning to their homes." (*Op. Cit.* pp. 150, 151.)

63. Dr. JUKES states, that the disease travelled along the high road from the Deckan to Panwell, and that he has not heard of any village in the Conkan that has had the disease, but by intercourse with places in which it had been already prevalent. "If it be something general in the atmosphere," he remarks, "why has it not hitherto made its appearance in some two distant places of the province at the same time? Nothing of this kind has, I believe, been observed: it still seems to be creeping from village to village, rages for a few days, and then begins to decline." (p. 173.)

64. Dr. TAYLOR reports that "whenever the disorder appeared in any particular spot or family, a considerable proportion of the family or neighbours were attacked within a very short period of each other: on many occasions I have seen three or four of a family lying sick at once." (p. 195.) Dr. BURRELL informs us that in the short space of six days every attendant, in his hospital, on the patients affected with cholera had the disease.—(*Bombay Report*, p. 9.) And Mr. CRAW states, that every one of the attendants, thirty in number, in the hospital of the 65th regiment, were attacked.

65. The next report which issued from India was edited by Mr. JAMESON, and was published at Calcutta in 1820. This gentleman, whilst he reasoned in an extremely loose manner against the existence of an infectious property having been evinced by the disease, and without furnishing proofs of its absence, actually adduces evidence of that property which he is endeavouring to disprove. Thus, where he is stating in general terms, and without any reference to reports from the different medical officers in the establishment, that the disease did not seem to be more preva-

lent in the tents or hospitals of the divisions of the army, in which the sick were treated, he communicates the following important fact in a note. "A Sepoy died of the pestilence. Five of the corps, who had shown no signs of illness, were employed to carry the body to the grave. They were all seized with the disorder during the ensuing night, and all died." (*Calcutta Rep.* p. 130.) Mr. JAMESON, instead of appearing as the editor, or publishing reporter, of the opinions sent to the Calcutta Board, states his own views, endeavours to explain away those which are different from them; and thus the publication, which in the title-page professes to be a report, conveys not a single line of information from any one on the Bengal establishment, excepting this writer himself. The work, therefore, cannot be looked upon as furnishing the opinions of the majority of medical men in this part of India, inasmuch as we find no authorities or opinions contained in it but those of Mr. JAMESON himself; and these are evidently so perfectly at variance with one another, and with the ascertained laws by which those diseases, which are familiarly recognised as infectious, are governed, that we cannot, even although we receive some of the facts which he adduces, consider him as an authority on this subject. In all his remarks he seems to suppose that contact is requisite to the propagation of contagious diseases, and that because some persons in contact with the sick so frequently escape, the cholera is not contagious. He overlooks the influence of predisposition, which is so remarkably influential in all maladies which perpetuate themselves; and he entirely forgets the operation of those causes which often come in aid of the poison or effluvium exhaled from the bodies of the diseased, even after the exposure of a healthy person to it, and which frequently determine its action or call it into operation, when, without such reinforcement, it may have failed in producing its specific and deleterious effects. Could this gentleman ever had any experience of diseases admitted by all to be infectious—had he ever seen small-pox, measles, or scarlet fever? Notwithstanding those misapprehensions, and the evident bias which he betrays in favour of pestilential cholera being non-infectious, numerous facts escape him, eminently calculated to support the opposite doctrine. Thus he informs us that the medical staff present with the Hansi force was "*persuaded*" that the infection extended to it from the Meerut detachment, which caught the disease on passing through Delhi, where it prevailed. And at another place he informs us, that the centre division of the Bengal army were infected by a detachment which joined it whilst subjected to cholera. He endeavours, however, to explain away this occurrence; but it is evidently shown, and even admitted by himself, that the pestilence was introduced into this division, either by this detachment, or by some of the Rajah of Sumpter's troops, which were affected, and mixed with some regiments of the division.

66. After proceeding through a number of pages, in which Mr. JAMESON reasons against the infectious nature of the disease, what was my surprise when I found him, towards the conclusion of his observations on the subject, express himself in the following manner:—"This much, however, may be affirmed, from a review of the whole progress of the epidemic in this quarter, that the infectious medium, in whatever it consisted, was confined within a very circumscribed circle, and was very slowly extended to healthy parts of the atmosphere. If, setting aside the circumstances militating against it, we take it for granted that the infection was truly received by the centre and Hansi divisions from the detachments above mentioned, we must believe that the disorder, although not communicable by contact from person to person, was so from one large body to another large body; and that whenever the poison got head amongst a number of men, it assumed some new quality, so as, when mixed with the atmosphere, to become infectious. What constituted this additional quality, we cannot pretend to determine; but in support of its existence, we may quote the predilection of the epidemic for cities and camps; the infection of the left division, and the Nagpore and Meerut troops, immediately after entering into the diseased medium at Jubbulpore, Nagpore, and Delhi; and the similar case of the troops and followers in attendance upon the governor-general being attacked shortly after communicating with an infected village in the Gorruckpore district. To the same account may be placed the progressive march of the disorder from one part of an infected place to another, as in the centre and Hansi divisions, and more particularly the Rajpootana force, in which the virus seemed to be regularly propagated from corps to corps. In some instances the suffering body would appear to have sickened immediately upon coming into the poisonous medium, as was the case with the Nagpore troops, who were affected on the very day in which they encamped at the infected village of Gaongong; but more frequently one or two days would seem to have been requisite to bring the virus into action. Thus the Meerut detachment entered Delhi on the 29th, and was not affected till the 31st; thus, too, the Hansi troops had not the disease till the 6th, the day after the junction of that detachment. Again, by those abetting the opinion of the disorder being communicated to the centre division by the Shergur detachment, it is stated that the first cases occurred on the 11th, two days after its junction. Lastly, the followers of the troops in personal attendance on the governor-general in April first suffered on the 23d, three days after encamping near the infected village." (pp. 144—146.) This surgeon afterwards adds, that the disease recently appeared in a detachment of the Rajpootana force under such circumstances as at first seemed to warrant a suspicion of the existence of contagion. Now it appears somewhat surprising that the secretary of the Medical Board of Calcutta, sitting under the eyes of the governor-general, should have been allowed to issue his ipse dixit as to the non-infectious nature of a most devastating pestilence, then in its full strength, when these facts were in his possession, and when many others of a still more convincing character of the infectious nature of the distemper had passed through this very board in their way to the India House, in Leadenhall Street, where I had an opportunity of consulting them in 1827.

67. The foregoing quotation will be found to differ but little from the conclusions which an attentive consideration of the subject has led me to entertain. I have thought it right to be thus particular in the investigation of this subject, because, upon the adoption of correct ideas respecting it,

will mainly depend the employment of successful measures to circumscribe, entirely to prevent, or counteract the disease. And I hesitate not to maintain, that, owing to the very loose manner in which this subject has been considered, and to the neglect of means which the due interpretation of the information furnished even by the most sceptical as to the existence of infection, amongst the reporters to the India medical boards, ought to have led, are to be imputed, in no small degree, the propagation of the disease not only throughout India, but also to other parts of Asia, to Europe, and to America. I have thought it most advisable to go to the original sources for information as to this and various other topics, because the opinions of the Indian reporters were generally derived from an extensive and varied experience of the disease during a number of years, and they were not certainly previously biassed in favour of contagion, that being a property which the diseases of India seldom present. Whilst also the information which they furnish is of a superior description to that which has appeared elsewhere, the impossibility of obtaining it in this country—particularly the reports, the most valuable part of it—has induced me to refer to them in preference to other authorities. Having shown the identity of the Indian with the European pestilence, the arguments derived from facts observed in the one are equally applicable to both; and therefore I pursue the present topic, and further demonstrate, from the valuable and voluminous reports published by the Madras government, the inaccuracy of the opinions which have gone abroad respecting the disease in India, and which have vitiated the doctrines and paralysed many of the measures, both preventive and curative, which have been adopted in Europe.

68. Mr. SCOTT, the editor of the reports which were transmitted to the Madras medical board, and were published at length at that presidency, has given an able summary of the evidence which was furnished to him, in conjunction with the results of his own observation. The value of the information here conveyed, its accordance with the most accurately observed facts connected with the manifestation of the disease in Europe, and the difficulty of access to the original, will be a sufficient apology for the length of the following quotations:—"Bodies of troops in motion have been attacked, and have retained the disease, while it was unknown to the fixed inhabitants of the country through which they passed. One of two corps in a camp has been attacked, and the other has escaped the disease. Ships arriving from other parts of the world have never suffered under the assumed epidemic constitution of the atmosphere before reaching the shore." "Diseases avowedly infectious, such as small-pox, measles, &c., have not at all times the power of spreading epidemically: for while it is certain that their exciting causes are never wholly extinct, it is only at particular periods that these diseases become epidemic; but we are unacquainted with the circumstances under which this power of epidemic propagation arises. The same may be the case with cholera. All the atmospheric phenomena, and other circumstances brought under the head of occasional causes, have, with little or no interruption, existed from the beginning of time until now, without producing cholera—consequently the super-addition of a new cause must be inferred. An European, proceeding on his journey to Trichinopoly, on the 15th October, was taken ill about a mile from the Mount, brought back to the house where he had passed the day, and there died. On the 17th the wife of that person, on the 19th the owner of the house, and on the 21st his wife, all experienced attacks of cholera, but recovered. Several of the native servants also suffered. The instances of the disease appearing at places immediately after the arrival of corps and detachments which were suffering from it are very numerous. For example, it appeared at Jaulnah immediately after the junction of a party from Nagpore, amongst whom it prevailed. It appeared at Aurungabad, and at Malligaum in Kandeish, after the arrival of parties who had left Jaulnah at the time the disease was prevalent there, and amongst whom it had broken out on the march to these places. It appeared a second time at Malligaum, after the junction of the 1st battalion of the 5th regiment, in which cholera prevailed. It appeared at Secundrabad after the arrival of a detachment suffering from it, and it appeared afterwards in the villages through which the detachment had moved. It appeared at Gooty, where no case had been observed for six months before, immediately after the arrival of the 1st battalion of the 16th regiment of foot, in which it prevailed with great mortality. It is remarkable that the same formidable type of the disease which prevailed in the marching corps was communicated to the corps at Gooty. It also spread on that occasion to the adjacent villages. It also appeared in a detachment of artillery, previously perfectly healthy, upon their encamping on the ground which had been immediately before vacated by the 1st battalion of the 8th regiment, in which corps the disease prevailed. The bodies of several persons who had died of cholera remained exposed on the ground when it was taken up by the artillery. The prisoners in a gaol, enclosed by a high wall, have escaped cholera, while it prevailed all around them; and the inhabitants of certain hilly ranges have also escaped the disease. These have been said to have interdicted all intercourse with the people below. When cholera is once established in a marching regiment, it continues its course in spite of change of position, food, or other circumstances. Its approach to a town has been traced from village to village, and its first appearance in a town has been in that quarter which was nearest the track of its progress. The sudden appearance and disappearance of cholera, however unlike the progress of known infectious diseases, is not admitted as being irreconcileable with the doctrine of infection, especially if the disease be of sudden invasion after the application of the exciting cause. The relations who have attended on people ill of cholera, as well as the nurses appointed in military corps for that duty, and in general those whose employment has led them to be much with the sick, have been observed, in very many instances, to be attacked with cholera during, or shortly after, their attendance. The sick in hospitals labouring under other diseases have likewise been observed to be attacked with cholera, especially those who lay near the patients ill with that disease. Sometimes whole families have been swept off successively. Servants have often been

observed to sicken after attending their masters." —(*Madras Reports*, p. xlviii. *et seq.*)

69. This, however, is only a portion of the facts and circumstances advanced by Mr. Scott in proof of the infectious nature of this pestilence. In addition to the foregoing, I may add the opinion of several able and experienced surgeons and physicians, contained in their reports to the Madras Government:—Superintending Surgeon DUNCAN states, that "the 34th regiment carried the pestilence with them from Bellary to Nundydroog, and there was no trace of the disease in any village on the road. Since the regiment passed, every village on the road has been attacked by cholera."—(*Madras Rep.* p. 111.) Mr. TRAIN adds, that "the attacks have shown a great disposition to run in families, and even among the attendants on the sick; and have in such cases been much more severe than usual." (p. 131.) Mr. ENGLAND observes, that "the disease has been greatly felt amongst the attendants on the epidemic patients at various places." (*Op. Cit.* p. 170.) He also notices the extension of the disease from troops and travellers to places on the roads through which they had passed, and other facts similar to those already recorded in proof of its infectious nature.

70. Mr. CHAPMAN, after stating facts perfectly in accordance with those furnished by the reporters already quoted, adds, that he feels most confident of having experienced the attack of the disease, under which he had with difficulty recovered, from infection. Being anxious about a patient, he remained with him for several hours, watching the progress of the disease. He felt nausea on quitting him, but attributed it to the peculiar fœtor evolved from the evacuations. On the following morning he was attacked with cholera, which nearly proved fatal. He proceeds—In the same detachment, a woman, anxious about the safety of her child, slept in the hospital tent, in which several choleric cases were present; in the morning she was attacked with the disease, and died. Three orderlies, also, slept in the hospital, and in the morning one of them was attacked, but recovered. "Thus it will be seen, four persons sleep in an hospital containing the infection of cholera, and that two are on the following morning attacked with the disease—whereas from the whole camp, consisting of 1500 or 1600, not five cases had occurred." "That the disease is contagious appears to have been observed by the natives themselves, and it thus commonly happens that the sick are avoided by those whose duty does not call on them to attend. A village in which cholera is prevailing is usually evacuated for a short period, until the disease is annihilated; these, and many others, are the proofs of their opinion of its contagious nature." (p. 189.)

71. Mr. STOKES, in his comprehensive report, states several well-ascertained facts, showing the infectious nature of the disease. The case of Mr. RUMBOLD, assistant-surgeon, is almost demonstrative of this property. He had been visiting some very bad cases, when he was seized with sickness at his stomach, and giddiness; and coming out of the tent, he fell down faint, and from that period he believed himself infected with the malady. He soon became one of its victims. The sickness and faintness with which Mr. RUMBOLD, in a state of high predisposition "from fatigue of mind and body," was affected, may be easily accounted for by the information which Mr. STOKES gives in the following page. He states, that in the worst cases—"a peculiar and offensive fœtor was observed to issue from the body, particularly when it was covered with much sweat; it was very disagreeable when first perceived, and seemed to hang about the nostrils, exciting, long after, an unpleasant sensation." (p. 211.) In another place, he remarks—"It was found amongst many who came to the hospital, that some time previous to their being attacked, the disease had existed in the family to a greater or less extent, or some one branch had been ill or died of it. In others, it had spread progressively through the whole, or nearly; and among those who officiated as orderlies or attendants at the hospital, several were attacked, and some died." (p. 217.)

72. Mr. PATTERSON observes as follows:—"I feel convinced that a corps on its march, catching the exciting cause, will carry it along with the corps for weeks, and to a very considerable distance. Let this corps be halted on the finest spot of ground possible, let healthy corps join this, at short and regular intervals, and I feel convinced the disease would attack those healthy corps in a few days, and according to their respective arrivals. If this be not contagion, I do not know what name to give it." (p. 224.)

73. Dr. DAUN, whilst he refrains from giving any opinion as to the contagious nature of the disease, states the following facts in proof of it:—"On the 10th, when in attendance on O'Brien, I became indisposed in such a way as to lead me to apprehend an attack of the epidemic. On the 12th, Mr. Gray was attacked, after having been up part of the night with Thomas Flannigan. Mr. Gray was, during his illness, constantly attended by Lieutenants S. and M'D., who have since had both of them attacks of the epidemic, and no other officers except them at this station have been attacked. (*Op. Cit.* p. 273.) And lastly, as respects the official reports, Mr. KELLIE furnishes both facts and arguments, many of them similar to those already adduced in support of the infectious character of the pestilence. (pp. 68—77.)

74. The above evidence, I consider amply sufficient to prove that the disease, even from the commencement of its ravages, evinced, unequivocally, infectious properties. If my limits would permit, I could also demonstrate from the same sources that the eyes of many were shut, by previously entertained dogmas on the subject of contagion, against this property; and that several, even where they were arguing against its existence, were actually adducing important facts in support of what I have been cautiously led to believe, namely, that the disease manifested a tendency to propagate itself by means of a morbid effluvium exhaled from the bodies of the affected, similar to what is evinced by measles, and fevers whose infectious properties have been well ascertained and generally admitted.

75. It appears extremely singular, that, notwithstanding the evidence which has been now quoted, in the very words of the reporters to the different Medical Boards, no means of preventing the propagation of the malady were resorted to during the number of years it has existed in the East. Surely the doubts even of the sceptical ought to have led to a careful inquiry; and most

certainly the natives of the country, and the European population under the British dominion, had even a *right* to expect that those placed to watch over their health, and to devise measures for its preservation, would have attended to the unequivocal opinions expressed by a number of the best informed medical officers in the service; and that, although a great difference of opinion existed among them, this very circumstance should have led to more intimate inquiry and a careful sifting of the truth. At all events, the error—if error it could be called—should have been on the safe side; and the Medical Boards, superintending surgeons, or others, to whom the duty appertained, should have pointed out the importance of preservative measures to the government, and to civil or military officers placed over districts and corps, and have adopted the suggestion of one of their most able medical officers, who has stated the following in one of his reports to the Madras Board:—"Whether or not the disease in question be contagious is a subject of infinite importance; but where the slightest gleam of doubt obtains, it is surely better to adopt the means usual for the purpose of preventing its propagation, by appropriate *quarantine* of troops on the line of march, by preventing their immediate entrance into stations when under the influence of cholera. By these precautionary measures, I conceive it possible to preserve the lives even of thousands of individuals." (p. 189.) That no precautions of any description were taken in India to prevent the propagation of the disease, may be stated without any reservation; and hence most probably the reason of its extension over so very large a portion of the whole globe.

76. Before leaving this part of the subject, it may be as well to take a hasty glance at the opinions expressed by some other authors who, having observed the disease in India, have written respecting it. Mr. ORTON, who published at an early period of the epidemic an able work on it, referred it to electro-aërial influence. He now states his belief in its infectious nature. Mr. ANSLEY expressed himself in his publication against the doctrine of infection, and imputed the disease to a similar state of the air to that assigned by Mr. ORTON, without being able to point out in what this state consisted. But "de non-apparentibus et non-existentibus eadem est ratio." Mr. ANSLEY, however, appears not to have directed that attention to the subject of infection in relation to the disease, which would impart much importance to his disbelief in its existence. In proof of this, I may merely refer to the circumstance of his quoting the letter of a correspondent, containing the following remarkable proof of infection, without adding any explanation or remark:—"We have, however, been particularly fortunate till our arrival at this station, not having lost a man, or having one seriously ill, though we had been under canvass above five weeks. We fell in with a battalion of native infantry who were suffering from cholera; the next day six Europeans were attacked, the number increased daily, and most of the first cases proved fatal." Dr. KENNEDY, from extensive experience of the malady amongst both native Indians and Europeans, states facts and arguments, in proof of its infectious nature, and he justly places particular stress upon the peculiar odour exhaled from the bodies of the affected, as indicating the generation of a principle calculated to propagate the malady.

77. I have now shown, from the chief sources, that the disbelief of infection, in respect of the pestilential cholera, was not general in India—that the productions which issued from the three Medical Boards very strongly favoured, and indeed proved, the existence of this property,—that two out of the three actually insisted upon the activity of its influence,—and that, therefore, the dangerous opinion, so very generally propagated, and even acted upon, both in this and foreign countries, that the authorities in India did not consider the disease infectious, is entirely without foundation in truth.

78. The identity of this pestilence with that which has ravaged the East has been proved, and, indeed, is scarcely anywhere called in question. Some authors have supposed that it has acquired new properties and characters, since its first appearance and early prevalence in India, and that its infectious property is one of these. But I am entirely convinced that this is not the case. Even varieties of the disease cannot be admitted; for it is essentially the same, presenting merely gradations of intensity, and modified effects according to these gradations.

79. Several writers have supposed that the disease has originated in a number of distinct and far distant places, from those causes, to which the disbelievers in infection altogether impute it, and to which I shall direct a brief attention (§ 97, *et seq.*); and that it has, owing to the combination of those circumstances and causes which are generally admitted to be productive of infection, assumed this character,—or, in other words, that the malady was not originally infectious, but that it has had this property superadded to it, from the circumstances of imperfect ventilation, neglect of cleanliness, and crowding together of the sick. There cannot be the least doubt of those being fertile sources of an infectious principle, and that they tend greatly to aggravate all diseases, whether infectious or non-infectious; but I have remarked, in the course of my inquiries, and of my personal observations, and in the accounts of various observers, that the propagation of the malady from the affected to the unaffected frequently took place, although not to the same extent, or with the same malignity, in open, and airy, and thinly inhabited situations; and during opposite states of the atmosphere as respects both humidity and temperature.

80. I shall next adduce proofs of the infectious nature of this pestilence in other parts of Asia, in Europe and elsewhere. But I shall be very brief, because, the identity of the malady in both hemispheres having been fully and generally admitted, and its infectious nature in India having been completely proved, it must necessarily possess the same character in Europe, unless counteracted by powerful means; and, therefore, a minute detail of facts is not required. Several authors have insisted on the proofs which have been furnished of the introduction of the disease into the Isle of France by the Topaze frigate, and the circumstance of about 20,000 of the inhabitants having been seized with it, above two-thirds of whom died, no precautionary measure having been resorted to; but that when the malady had been propagated to the adjoining island of Bourbon,

a sanitary cordon was established, and only 256 persons were attacked. When the disease appeared in Aleppo, in 1822, the French consul, M. DE LESSEPS, convinced of its infectious nature, placed himself, his family, and all those who wished to join him, in strict quarantine, in a place adjoining the town. This colony, consisting of about 200 persons, remained perfectly secure from the disease, although 4000 persons died of it in the city. If it proceeded from some unknown state of the air, as supposed by the anti-infectionists, to what cause can we impute the escape of those who had so secluded themselves, for they surely must have breathed the same air as those who were affected? M. HUBENTHAL states, that a peasant having arrived from Arkatal, on the borders of Persia, at the village of Neskutshne, to visit an uncle, was seized, the night of his arrival, with the disease. The persons engaged in restoring the heat of the body by frictions, &c., four in number, were attacked on the following day, and three of them died. Precautions were taken by the police to arrest the progress of the pestilence in the village, and it spread no further. If the causes of the seizure had existed in the air, or state of the locality, how came all the inhabitants, excepting those who had been exposed to the inhalation of the effluvium from the affected person, to escape?

81. According to the reports of the Medical Board of Ceylon, the disease made its appearance in 1819, in Jaffnah, in Ceylon, imported from Palamcottah, with which Jaffnah holds constant intercourse, and thence it was propagated over the island. In August, 1820, the Leander is stated to have called at Trinquamalee from Pondicherry, and to have landed several of her crew affected with cholera. Trinquamalee soon afterwards was infected, and the pestilence was again propagated over the island. The island of Sumatra was believed to have been infected in 1819, from the intercourse carried on between Achem and Malacca across the intervening strait; and it seems to have reached Penang and Singapore towards the end of the same year, in the same manner. Dr. LABROSSE states that the prisoners in the gaol of St. Denis, in the Isle of Bourbon, who were employed in the removal of the dead bodies, all died of it;—that, at the lazaretto, two servants alone escaped;—and that in the hospital it was communicated to the attendants and other patients. M. MOREAU DE JONNES states that it was imported into Muscat, in Arabia, by the English East India ships; and Dr. SALINAS says that it was carried into the port of Bassorah, in 1821, by a vessel from India; and that it spread from this port, extending from town to town, even as far as the coast of Syria. When the pestilence reached Manilla in 1820, where it was believed to have been imported by ships whose crews had been, or were, infected, those vessels in the harbour which abstained from intercourse with the shore entirely escaped. At Bankok, the capital of Siam, it was said to have been introduced by the ships trading there from British India. It was supposed that 40,000 persons were attacked in this city and vicinity. Its appearance in Java, in 1821, was likewise considered to have been owing to the unrestricted intercourse of infected vessels, particularly the junks trading to Samarang, whence the pestilence spread over the island, carrying off upwards of 100,000 of its inhabitants. Its irruption in Canton, in 1820,—in Macao, in 1823,—in the Moluccas in the same year,—and in various places in the Persian Gulf, and on the coast of the Arabian peninsula, was generally attributed to vessels which had arrived from infected places.

82. Dr. MEUNIER states that, at Bagdad, where a third of the inhabitants was attacked, none were affected but those who approached the sick. Dr. REIMANN says that there was not a single instance of a town or village in Russia which contracted the malady without previous communication with houses or persons affected. Drs. RUSSELL and BARRY, who were sent by the British Government to St. Petersburg, in order to investigate the nature of the disease, state that the number of medical men and hospital attendants attacked with cholera in that city was extremely great, particularly in ill-ventilated hospitals; and they, as well as Dr. WALKER, who was sent to Moscow, express their belief in its infectious property. The report from these gentlemen to the Privy Council, dated the 20th of September, at St. Petersburg, has been kindly allowed me for perusal by Sir WILLIAM PYM, and it abounds in proofs, remarkably in accordance with the quotation from Mr. SCOTT's report (§ 68.), demonstrating the infectious nature of the disease.

83. The director of sanitary police at Petersburg, Dr. REIMANN, after expressing his conviction that the Russian pestilence is entirely the same as that which has been so fatal in India, states that most decisive proofs have been furnished him that it has not been of indigenous production, but has been introduced by persons who have arrived from infected places on the borders of the empire. He further states that he is convinced of its being less active, and less fatal, according as the place in which it is introduced is more airy, elevated, clean, and free from the usual cause of insalubrity; whilst its increased fatality in low, moist, thickly inhabited, and dirty places, has been demonstrated on numerous occasions. The personal and domestic cleanliness of the inhabitants has also a most remarkable effect upon the infectious property of the malady and its fatality. In proof of this, Dr. REIMANN states that in a village almost entirely peopled by Jews, 700 deaths occurred from amongst few more than 800 who were attacked. These conclusions are perfectly in accordance with the laws of all infectious diseases, and are entirely such as *à priori* reasoning would lead us to adopt.

84. In September, 1823, the disease first appeared at Astracan, and the Russian government resorted to preventive measures in order to arrest its progress. Whether or not those measures were the cause of its disappearance may be difficult to determine; but it did disappear, and it was not until 1830 that it showed itself again in that city. In 1828, the pestilence broke out in Orenburg, and was supposed to have been introduced either by the caravans which arrive there from Upper Asia, or by the Kirghis Cossacks, who are adjoining this town, and amongst whom it was said to have prevailed at this time. During the winter the number seized was not great; but in the spring of 1829 it raged severely, and extended to the villages in the province. During its prevalence in this part of the Russian empire, many

of the physicians, who at first did not believe in its infectious properties, were induced to change their minds, chiefly owing to the circumstance of its appearing in places very soon after the arrival of persons affected with it. Several instances of this description have been recorded by Dr. LICHTENSTADT amongst the official documents published by him. Another circumstance evincing the infectious nature of this pestilence was the peculiar irregularity of its course; and to this may be added, its extension in the lines of the principal roads and channels of traffic.

85. The introduction of pestilential cholera into Astracan, in 1830, was traced to a vessel which arrived from Baku, a town on the shore of the Caspian, and at that time affected with cholera. This vessel lost eight of her crew on the voyage, and the sick were brought to the lazaretto; a day or two after which the pestilence first appeared in this populous town. According to Dr. SOLOMOV, it attacked the suburbs on the 27th of July, and gradually extended to the nearest villages, and thence over the whole government. It proceeded through the Cossack stations and towns on the highway to Moscow, and up the streams of the Volga, at the mouth of which Astracan is situated. Its extension was attributed to the fugitives from the places successively attacked. After visiting the principal towns, and committing unheard-of ravages on the high roads to Moscow, the pestilence reached that city at the end of September. Towards the end of 1830, or soon afterwards, a body of troops from Koursk, a province at that time affected with the pestilence, was marched against the Poles. These troops carried this scourge along with them, affecting the places in their line of march through Podolia and Volhynia. In this way the towns of Astrog, Zaslaf, and Luck became infected; and from the last of these places the disease passed the Bug into Poland. Here it appeared with the invading Russian army, and was communicated to Lublin, Siedlec, Praga, the Polish army, and Warsaw.

86. The following is an extract from a letter written by a clergyman, who witnessed the disease in Saratoff, and published in the *Quarterly Review* for November 1831.—"Scarcely had we heard of the breaking out of cholera in Astracan, than the news came to us like lightning, that it was coursing the Volga, and that it was severe, and had already reached Zaretzin. Without a dread of the presence of the angel of death, the vice-governor, the medical inspector, and the government as well as the hospital surgeon, at once went into the infected places of this province. On the evening of the 6th of August we heard that three persons had been seized with cholera who had left Astracan, and were carried to our hospital. On the 7th, others were reported to have been carried off by this malady with such frightful rapidity, as to have impressed all minds with deep consternation, especially those who dwelt in the second division of the town. The disease soon appeared in the third division, and seized so many, that the hospital could no longer contain the sick, and killed so rapidly, that they scarcely survived six hours. The evil came so suddenly on us, that we had no time for taking precautions; our governor and our surgeons were gone to meet it afar off, in order to preserve our city, but it was already among us before any regulations could be made, or any means of opposing it could be devised. It could scarcely be reckoned an epidemic, depending on some change in the atmosphere, for many places were left untouched in our neighbourhood, while in Saratoff there was scarcely a family who had not to lament the loss of some of its members.

87. "In the very commencement of the epidemic, all our four surgeons were seized with it; two died on their journey to Zaretzin, and one here. From this moment fear and anguish took possession of the public mind. They who could flee from the city, fled; and, as the malady was not considered contagious, servants, labourers, Tartars, and Russians, were permitted to rush into the country. My congregation, which consisted of 550 individuals, was reduced to 150. Many of the fugitives died on the road, and spread the malady whithersoever they went. From the 10th of August the malady increased in virulence; the daily mortality of 4 rose to 5, 12, 20, 80, 120, 200; and one day to 260, and decreased in the same gradual mode. Up to the 30th of August, 2170 persons died. While all around was infected, Sarepta, in which the quarantine regulations were most strict, escaped, and yet this disease is not called contagious."

88. From amongst other evidence—indeed, I may say a mass of evidence—that furnished by Dr. REIMANN of St. Petersburg, as to the extension of the disease through Russia, may be adduced:—"The cholera was brought to Astracan by ships, and it has spread itself over Russia from Astracan by the emigration of the inhabitants, principally those of the lower orders. This is the chief cause of its propagation in Russia; it has never shown itself in any place except where it has been brought by travellers who came from infected places. *We have not a single instance* of a town or of a village, which, without communication with houses or persons affected, has contracted the disorder. Several places surrounded by the disease have preserved themselves from it by a rigid insulation."

89. The introduction of the pestilence into St. Petersburg is referred by Drs. BARRY and RUSSELL to the arrival of vessels from places on the Wolga where it prevailed. In that capital the infectious nature of the disease was shown, not only by the mode in which it was propagated in various quarters, and by its introduction into, and extension through, the prisons and hospitals of the city, but also by its exclusion from some places by a rigid insulation. Amongst numerous other instances the following may be mentioned:—Up to the 13th of July fifteen hospital physicians were attacked by the disease; and "the proportionate number of attendants of all descriptions on the sick, who have been taken ill with cholera, is fully greater than that of the medical men." "There were 150 pupils on the officers' side, (Military Academy at Cronstadt,) which is kept perfectly distinct from the school for petty officers and sailors. The gates were shut on the 19th of June, and as strict a quarantine as possible maintained to the 6th of August (O.S.). No case occurred amongst the pupils, who are from nine to twenty years of age."

90. In a letter from Dr. RUSSELL (*Medical Gazette* for November 11th, 1831), the following

remarkable fact is communicated:—"The son of a villager in the government of Pensa, who was coachman to a nobleman at fifty versts distance, died of cholera; the father went to the place to collect the effects of the son, and brought home with him his clothes, which he put on and wore a day or two after his arrival at his native village. He was shortly thereafter seized with cholera, and died of it: three women, who had watched him in sickness, and washed his body after death, were also seized, and died of the disease. The doctor arrived in time to see the fourth case; and, finding that the disease spread on that side of the village, he had the street barricaded on the side where it had not reached, and interdicted all communication to the two sides of the village. In that side in which the disease first broke out, upwards of 100 cases of cholera occurred, of whom forty-five died, but it did not appear on the other side of the barricade." And Drs. BARRY and RUSSELL report, that "the Navarino corvette, Captain Nachinoff, 200 men, had been placed two miles to the eastward of Cronstadt during the epidemic, to question and examine all craft from St. Petersburg. She had eleven severe cases of cholera, of whom eight died. Her first and second cases occurred on the 26th of June, O.S. These two men belonged to the boat that examined the vessels coming from St. Petersburg, on board many of which they had been. The next men who fell ill were of those who carried the two first cases to the hospital in town." These are but a very few from the many facts of the same description now before me.

91. With regard to the appearance of the disease in Berlin, the following extract of a letter from Dr. BECKER of that city, dated the 29th of September, 1831, furnishes information:—"I am a most decided contagionist, and it is the force of facts which has made me so; for on the authority of your Indian practitioners I formerly believed the cholera not to be contagious. The appearance of the disease in Berlin, and the manner in which it has spread, is also very remarkable, and affords supplementary evidence in favour of contagion. The conclusion at which I have arrived is, that the *efficient* cause of the Asiatic or malignant cholera is always a virus, the production of *human effluvia*, and which, according to common medical language, undoubtedly deserves the name of a *contagious principle;* but that this virus, in order to produce the disease, requires, first, like the contagion of the small-pox, measles, typhus fever, and even the plague, a disposition of the atmosphere favourable to its development; and secondly, a peculiar disposition of the animal economy in every person who is exposed to it. This disposition appears to be brought on by previous disease, particularly bowel complaints, by excessive fatigue, cold, errors in diet, drunkenness, fear, &c. One young physician has been one of the first victims of the cholera, a decided anti-contagionist; he carelessly exposed himself, died, and, as if his case was to be a warning proof of the fallacy of his opinions, his death was immediately followed by that of his landlord and two children, and the illness of the servant-maid in the house, the only instances of the disease in that street." In a report subsequently given by Dr. BECKER (*Medical Gazette*, 12th of November, 1831), it is stated distinctly that the disease was introduced by the vessels navigating the river Spree, which runs through the city.

92. The introduction of the disease into this country was certainly owing to the clothes and bedding of sailors, who died of it at Riga, and other northern continental ports, or during the voyage from these ports, having been too generally preserved and delivered up to their friends, upon the return of infected vessels to British ports. Of this fact, already adverted to (§ 16.), several proofs of a most incontrovertible nature were furnished me by two masters of vessels, on board of which several cases of cholera occurred during the voyage from infected ports. These masters were at the time, conformably with the then prevailing opinion, persuaded that the distemper could not be propagated by the clothes of those who had died of it; but facts soon afterwards occurred which demonstrated to them the propagation of the malady in this manner as well as by direct communication with the affected. Soon after the opening of the first Cholera Hospital in the vicinity of London, near Bermondsey, I passed a considerable time with the patients first admitted, and was present during the inspection of two fatal cases. I drove thence in an open carriage and saw two relatives, residing in an airy situation in Pentonville, a distance of from three to four miles; and yet the persons whom I visited, after so long a drive in the open air, complained to me instantly upon my entering their apartment of the offensive odour which proceeded from my clothes. I was cautious in not mentioning the source of this odour, and no suspicion was entertained by them of the cause. But the following day I was called to them, and found them both in an early stage of the distemper, from which they ultimately recovered with difficulty. Precautions were taken against the further extension of the malady in this house, and no case occurred in the vicinity until some months afterwards. Other proofs of infection occurred to my observation; but it is unnecessary to advert to them at this place. I shall hereafter state briefly the conclusions at which I have arrived after the closest attention I could devote to the subject.

93. ii. *The infection of pestilential cholera, assisted by predisposing, concomitant, and determining causes.*—It may be briefly premised, that this disease is never produced without the presence of a certain leaven, or morbific matter, which, emanating from the bodies of the affected, and floating in the air, is respired by those about to be attacked. This is the clear and only inference connected with its transmission that can be deduced from the body of evidence now placed before the reader. Those who argue against its transmissible nature cannot show, since the irruption of the pestilence in India, down to its arrival in this country, and transmission thence to America, a single instance of its appearance in any place without the previous communication with an infected place or persons, of a nature to propagate the malady. The non-infectionists place great reliance upon the circumstance of the disease having, in several places, spared a large number of those who have come within the sphere of its influence. But they must be aware that a similar circumstance is uniformly met with during the prevalence of all diseases acknowledged infectious. All who are exposed to them are not equally, and many are

not at all, liable to be affected by them; and the person who may not have been susceptible of the infection to-day may be susceptible to-morrow, owing, very frequently, to the causes about to be noticed. This pathological fact is familiar to every observer in respect of small-pox, measles, scarlet fever, and the true typhus—diseases whose infectious nature is very generally admitted; and wherefore should it be otherwise in respect of the present pestilence? The same fact, moreover, has been remarked of all pestilences of which we have any accurate information in medical annals. In illustration of this, I may notice what has fallen under my own observation. During the dry easterly winds which occasionally prevail on the west coast of Africa, it is frequently impossible, and always difficult, to infect the system with small-pox, even by inoculation; and when the operation succeeds, the disease is usually mild, and the eruption distinct; whereas, during the moist, close, and sultry weather following the rainy season, it spreads with the utmost rapidity; the effluvium from the bodies of the affected appears to be carried to considerable distances, and transmitted readily by means of various media, the disease being generally confluent, and most fatal.

94. The circumstance of so many persons escaping, besides being referable to this non-predisposition, may likewise be explained by the circumstance of free ventilation, the perflation of currents of pure air, by modes of living calculated to oppose the invasion of the infectious effluvium, and by being habituated to the influence of this principle. We frequently observe that persons constantly present in places contaminated by an infectious effluvium are less liable to be attacked than those who are suddenly introduced from a purer air, but at the time predisposed to infection. This has often been demonstrated by the experience of others as well as of myself. Thus, on the first occasion of my visiting the cholera hospitals and cases of the disease, a sensible effect was produced upon my respiration, pulse, and digestive functions, that was less and less manifested on each successive exposure to the concentrated emanations from several of the sick placed in one apartment. A similar fact was observed by others; and, although it was very remarkable in this distemper, it has also been noticed in respect of other infectious maladies. Thus, a person confined in a close apartment with the true typhus fever was visited by a friend: the visitor, upon entering the apartment, felt a peculiar disagreeable odour, which occasioned a slight faintness and nausea, followed by headache, indisposition to action, &c. This slight indisposition continued for several days, when, about eight or nine days afterwards, typhus fever was fully developed. The person thus infected was kept in an airy apartment, and directions given as to ventilation, &c., with the view of preventing its extension; and the means employed succeeded as far as regarded the members of the family; but, when convalescent, a friend was admitted, and this person caught the disease. What the ultimate progress of the malady was in respect of this third person I had no means of knowing; but I have no doubt that the disease was communicated, in these two instances, if not in the one first referred to, whilst none of the constant inmates of the families were infected.

95. Another circumstance showing the operation of a specific cause in producing the pestilence, is its uniform and specific character in all climates, seasons, and localities (§ 112.). If the efficient causes of the disease were diversified, or consisted of the contingent combination of several, we should naturally expect a similar diversity of effects, and a constantly varying malady, both at its commencement and during its advanced progress; but such has been shown not to be the case (§ 53, *et seq.*) The efficient cause is specific, the disease itself is specific, and only modified as respects severity or grade, and the manifestation of certain subordinate phenomena, by the intensity of this cause, by certain predisposing, concomitant, and determining influences, and by the habit and temperament of the affected (§ 97—101, *et seq.*).

96. Having stated that the pestilence is not communicable to any excepting to those who are circumstanced or disposed so as to allow the invasion of its exciting or specific cause, it will now be necessary to notice those circumstances which co-operate in this manner; and this is the more necessary, as those who deny the infectious nature of the disease refer it altogether to certain influences which *predispose* the frame to the action of the specific cause, which reinforce or *accompany* it, or which, owing to their presence *after* exposure to it, determine its operation, or bring it more rapidly or more efficiently into action, when it might otherwise have failed of its effect.

97. Many of the earliest reporters and writers on this pestilence, who disbelieved in its infectious nature, had recourse to the state of the seasons in India to account for its occurrence. Some referred it to the prevalence of easterly winds, with long-continued or heavy falls of rain, by which the air was rendered moist and vitiated,—others, to sudden or extreme variations of the electrical conditions of the atmosphere, which variations were mere suppositions, and not matters of corroborated observation,—not a few, to the extrication of some peculiar terrestrial miasm, projected in distinct or remote places from one another, and proceeding in singular currents, so as to involve a part of a village, or a detachment, or even company of a regiment, whilst the vicinity was intact,—and several could detect no other cause for it, but exhalations proceeding from low, moist, and swampy situations, and other sources of malaria, rendered peculiar by some unknown cause, or productive of this peculiar disease from errors in diet or incautious exposure. Now it should be kept in recollection, that the existence of all, or any of these, was merely suppositious; that proofs were never adduced, and that the commonest meteorological observations were generally wanting. There was no uniform relation observed, either in this country, or in the eastern and western hemispheres, between the appearance of the malady and marked variations in the barometer, thermometer, or hygrometer, even in the few places where these were registered; but the irruption of the pestilence was often observed in states of season, weather, and atmosphere, opposite to those to which it has been confidently imputed. Even admitting that all the above-mentioned causes were actually in existence, (and I believe they were frequently present,) particularly during the severer irruptions of the disease, they merely show the truth of a part of my doctrine, viz., that the infectious nature of the disease was more strikingly evinced during

conditions of the situation, season, and atmosphere, of acknowledged insalubrity, — that whatever tended to lower the energies of the frame, as such causes indisputably do, favoured the operation of the infectious effluvium issuing from those affected by this pestilence, and rendered it more prevalent, when they were concentrated or uncommonly active; and that, in this respect, as well as in many others, the infection of pestilential cholera observes the same laws as other infectious maladies, as scarlatina, measles, &c., manifesting itself in isolated cases only during healthy states of season and atmosphere, and spreading to a greater or less extent during seasons of marked insalubrity, and during peculiar constitutions and vicissitudes of the air.

98. So far, therefore, from disputing the influence of many of those causes to which some highly respectable authors have imputed this malady, I fully admit their operation, even although their existence is more a matter of inference than of observation. I deny, however, that they are sufficient for the production of the destructive effects characterising this pestilence; and contend that as no such effects have, in the history of our species, been known to result from them, so we cannot, with justice, admit that they are alone capable of producing them, so as to generate this pestilence: I view them merely in the light of predisposing and concomitant causes coming in aid of a more powerful agent, which, emanating from the bodies of the affected, contaminates the predisposed in such a manner as to give rise to the same morbid actions as those which generated it; — that these imputed causes favour the operation of this infecting agent, 1st, by predisposing the frame to its influence; 2d, by reinforcing or assisting its action; and 3d, by determining or calling into operation the infecting principle. The predisposing and reinforcing influence of the different causes already referred to cannot be denied. We know, or at least observe, too much of their influence in respect both of contagious and infectious diseases which are familiar to us, to doubt their operation as regards this distemper: indeed, their action would be a matter of undoubted inference to the well-informed physician, independently of the results of observation.

99. But, besides the *Predisposing and Concurring Causes* noticed above (§ 97.), there are others not yet enumerated, of equal influence, not only in favouring the operation of the efficient agent of the malady, but also in calling it into action after the frame has been exposed to its invasion. The chief of these are, anxiety and depression of the mind; fear of the disease; physical and moral debility; low living and unwholesome diet; constitutional debility or laxity of the bowels; previous disorder of the digestive organs; neglect of personal and domestic cleanliness; deficient or filthy clothing; exposure to cold; the immoderate use of intoxicating liquors, or excess of any description; sleeping on the ground, or in low, ill-ventilated apartments, or in the open air; the use of cold, indigestible, or unripe fruits; cold drinks when the body is overheated; fatigue; sudden arrest of the cutaneous exhalations, however produced, &c. Either of these, whether acting shortly before, or at the time, or even soon after the body is exposed to the invasion of the infectious effluvium, will favour the production of the malady, particularly if several of them act in conjunction, and if, at the same time, those causes, whether proceeding from the state of the locality, or of the air, to which allusion has been already made, are also present.

100. One of the most remarkable of predisposing causes to an attack is *advanced age*, as well as one of the most unfavourable circumstances as respects hopes of recovery. Instances of attack previously to puberty were comparatively few; but the frequency of the seizure after 40 years of age increased in proportion to the advance in age, and the mortality in a still greater proportion (see § 21.); so that after 55 years recovery was rare.

101. It has been already stated, that a great number of the medical men called upon to treat this pestilence have imputed it chiefly to atmospheric causes, denying altogether the influence of infection; and the chief arguments which they advance, in order to show the absence of this property, have been and are about to be referred to (§ 97—99. and 102, *et seq.*). I verily believe, nevertheless, that this malady is infectious in a similar manner to measles and scarlet or typhus fever; that is, not by contact, but from the inhalation into the lungs, along with the air, of the morbid effluvium given out from the body or bodies of the affected. We know that the mere contact of persons suffering from the diseases now mentioned, will not communicate them even to the predisposed; whilst the presence in the air which is breathed of a scanty portion of the effluvium given off, during their progress, from the affected, will often produce them: and such, I am convinced, is the case with the pestilential cholera. We further know, that it is not easy to communicate these acknowledgedly infectious diseases by inoculation, when access of the morbid effluvium to the lungs is prevented. It, therefore, can be no matter of surprise to learn that M. Foy, and others of the young physicians who visited Warsaw, failed to propagate the malady by inoculation, or by tasting the matters vomited by the affected; even although the tasting matters vomited, under any circumstances, might well have turned the stomachs of many. Indeed, though cautiously convinced of the existence of the infectious nature of the pestilential cholera, I would have inferred that inoculation, or the introduction of the morbid secretions into the stomach of healthy persons, even were they predisposed to an attack of the malady, would have failed, in accordance with the laws which infectious diseases observe, to communicate it, provided the effluvium proceeding from the bodies of the affected be prevented from passing into the lungs. I as firmly believe that it is the inhalation of this effluvium into, and its influence on, the lungs of the predisposed, that paralyzes the nervous energy and functions of this very important and vital organ, occasions the singular collapse of it observed after death and evinced during life by the state of the hypochondria, epigastrium, and respiratory organs, prevents the changes which the blood is destined to undergo in the lungs from taking place, and gives rise to all the consecutive phenomena of the attack, as I am confident of any fact in pathology.

102. iii. *Arguments of those who contend that the disease is not infectious, further noticed.*—I have adduced above (§ 61, *et. seq.*) sufficient evidence of the

infectious nature of this pestilence, and have stated, under the head of concurrent causes, those to which solely the anti-infectionists impute the disease. I have now to notice, more particularly than I have yet done, certain arguments on which they rely in favour of their doctrine; and, first, they contend that, having had sufficient and admitted proof that cholera has not hitherto been an infectious malady, either as occurring in warm or temperate climates, wherefore should it change its nature, and become infectious at the present time? The ready answer to this is, that it is granted that the common cholera, whether that connected with a vitiated state of the biliary secretions, or that more severe form of the disease most frequently met with in warm countries, and denominated spasmodic cholera, or *mort de chien*, is not infectious; but that this can be no reason why this pestilence, which is distinct from cholera, occurring from other causes and under other circumstances, possessing also very different characters amongst which those of cholera are merely a part, and the least important part, should present this very important feature.

103. Secondly, they contend that, if this malady were infectious, a greater number of those who come near the affected would be attacked; and because, under circumstances already alluded to (§ 93, 94, 95.), so many do escape, that, therefore, the disease is not infectious. This is the chief argument on which Mr. SEARLE, referring to what took place in his own hospital at Warsaw, relies in support of his opinions as to the non-infectious nature of the disease. But as respects the escape of a large proportion of those who are exposed to the infection, this pestilence resembles all other known infectious diseases, not excepting even the most virulent.

104. Much stress also has been laid upon the fact of the disease not having been communicated by inoculation, and by tasting the ejections; but this proves nothing, and is merely an illustration of what ought to be known to every medical man —that diseases which do not generate a specific virus cannot be easily propagated in this way. Who, I would ask, would expect to communicate measles, scarlet fever, or typhus fever in this way? Who would expect to be affected by even a concentrated morbid virus on receiving it into the stomach? It is well known that the matter of small-pox and the poison of serpents may be thus applied without effect. That so many, or that all even, of the attendants in an hospital should escape, is only what most medical men of any considerable range of observation would expect, reasoning from their experience; this point, however, has already been disposed of (§§ 93, 94, 95. 101.). But the facts are, even on this point, as respects this pestilence, opposed to the doctrine of the non-infectionists; for it has been proved on numerous occasions, several of which have been noticed when demonstrating, by direct proofs, the infectious nature of the disease, that a very large proportion of the medical men and hospital attendants were attacked, notwithstanding the absence of all dread with which medical men and their attendants view disease, and their habitual exposure to animal and other insalubrious effluvia.

105. Thirdly, the non-infectionists argue, that numerous instances of the true pestilential cholera have occurred, which could not be traced to exposure to communication direct or indirect with those previously affected. This may be the case in a few instances; but how difficult is it to prove mediate infection, or that which takes place through the medium of fomites; and it may be asked, on how many occasions are persons liable to be affected by an infectious principle, without being able to account for the manner in which it took place, or to refer to the individuals whence it emanated, or to the media through which it was conveyed? We know that infectious diseases may occur almost immediately after the impression of the exciting cause, or not until after many days, or even weeks, according to the state of predisposition in relation to the intensity of the cause, during which interval certain latent or almost imperceptible changes are going on in the frame; therefore, during so indefinite a period of interval between exposure to the cause and the development of disease, how can all those attacked refer to the particular occasion on which they were exposed to infection?

106. Fourthly, the anti-infectionists refer to the occurrence of epizooties, in proof of a noxious emanation from the earth, which, floating in the air, affects both man and beast, and occasions this pestilence. I grant that emanations may, and sometimes do, arise from the soil, and affect man as well as the lower animals; and that, when this phenomenon takes place, it may be a concurrent cause of the pestilence, so far as to increase the predisposition to infection, and the fatal tendency of the disease. But, from a careful review of the occasions on which epizooties have been observed contemporaneously with the prevalence of this pestilence, I can state that they have been few, and merely coincidences, which by no means affect the question at issue. It should be kept in recollection, that several of the seasons preceding and during the prevalence of pestilential cholera have been unusually wet, and that increased mortality amongst the lower animals is often observed at such times. Many even of the instances of such coincidences on record are so vague, and so deficient in accuracy of details and dates, as to deprive them altogether of importance in the discussion of the subject. Besides, during the very long prevalence of this malady over the whole globe, it would have indeed been wonderful if the coincidence of epizooties with it had not been observed.

107. Fifthly, another circumstance made use of by the non-infectionists, is that of so many who have observed and treated the disease having espoused their side of the question. To this I may reply, that a very large number of those who have enjoyed this advantage have not had, even in India, as may be ascertained by referring to the reports of the Medical Boards, and to the documents at the India House, that extensive experience which we in this country suppose. It should be recollected, that a large proportion both of natives and native troops were treated by their native doctors. Besides, are we to expect those comprehensive views of the history and modes of propagation of a disease from those who have seen but a little, and described only what they have seen; or from those who dispassionately investigate the origin, the causes, the phenomena, and the relation of all that has been observed and recorded, and cautiously weigh the evidence on

either side of a disputed topic connected with it? The captain of a company, or even a colonel, performs an important part, individually, in an army during a general engagement; but he can know little, personally, of the disposition, changes, and evolutions of all its parts, and of the plan of strategy, according to which it first acted, or was led to change its operations, in order to meet or counteract those of its opponent. Like the commander-in-chief of the whole army, we, who collect, compile, arrange, and digest facts, on both the one side and the other of a disputed subject,—who observe closely what has occurred within the sphere of our own experience,—who compare, weigh, and meditate upon the whole evidence, personal as well as testimonial, with our minds uninfluenced by prematurely conceived ideas, are the best suited to investigate, and to conclude respecting them. Placed, by the number of accumulated facts, and by minds accustomed to view and to investigate the difficult operations of nature, on the elevated table-land of human science, we may be admitted to be more able to take in a comprehensive view of the causes and nature of disease, and to come to accurate conclusions respecting it, than many of those who, as observa tion has shown, have drawn hasty inferences from a few and very imperfectly investigated occurrences.

108. Sixthly, the non-infectionists also argue, that if the disease had been infectious, its propagation would have been prevented by the measures resorted to. To this argument I reply, that the disease, during its prevalence in the East, was never expected to be confined by sanatory measures; that it was not until it reached Astrachan that any such measures were attempted, and then only imperfectly; and yet these succeeded for eight years in preventing its entrance into that place; and that, where rigorous quarantine has been adopted, the measure has succeeded; several instances of the success of such measures having already been adduced.

109. The non-infectionists further state, that several continental states and authorities, convinced of the inutility of quarantine, have relinquished it. Granting this to be the fact, it merely shows, what any thinking person must admit, the impossibility of preventing the introduction of the disease into a populous town, situate in the vicinity of others, and of a thickly inhabited country, between which there must necessarily still be, even under the most strict quarantine, a constant intercourse of some kind or other, either by land or water, and perhaps by both. There can be no doubt, if the testimony of several well-informed persons, cognizant of the facts, are to be relied upon, that the distemper was introduced at several sea-ports of this country by the bed and body-clothes of those who died on board mercantile ships, that had been preserved and given up to the relatives of the deceased. But a strict quarantine and purification of these effects only could have prevented this mode of communicating the distemper; and in no instance were these observed. Indeed many ships arrived, during the latter part of 1831, in British ports, from infected places, having lost individuals from among their crews on the voyage home, and the fact was often either concealed or not attended to, the infection either proceeding further, or not, as circumstances concurred to favour it.

110. But let me turn for a moment to the causes which the non-infectionists substitute for an infectious principle. Some argue in favour of a certain distemperature, epidemic condition, or altered state of the air, being the cause of the disease. Now these are mere suppositions. But grant them to exist, how would they explain the progress and propagation of the pestilence? The air is a very mobile fluid, sweeping along frequently at the rate of seventeen and eighteen miles an hour, and being constantly renewed, both in a horizontal and in a vertical direction, unless in situations where it can be confined. But the disease has not been propagated in the course of winds, or with the rapidity which such a source would suggest: it has advanced slowly, and at the rate at which human intercourse takes place, in the lines or channels of such intercourse, and in the quarters where intercourse with previously infected parts has occurred. It has usually spread in a town, visited prisons or sequestered places the last, but affected them severely when introduced; and it has entirely avoided those who placed themselves altogether apart from the rest of the community.

111. If the constitution of the air were the cause, how came isolated places, in the middle of infected towns, or in the track of the progress of the disease, to escape? How could the disease be barricadoed, as it was in some towns in Russia, and shut out from certain districts and streets? How could it spread and travel along one side of a river, in the line of public intercourse, and never appear on the opposite side, or, if it did appear, wherefore did it, either first or merely, at the point where communication with the opposite banks takes place? When introduced into a country, wherefore should it break out first in sea-ports having intercourse with previously infected places, or in towns having inland communication with parts thus circumstanced? If the air were the source, how was its noxious property retained after passing hundreds, or even thousands of miles, as in the case of the appearance of the disease in the Isle of France; or wherefore did it, after this passage, respect the adjoining islands? How came the disease never to appear in any place without previous intercourse with a previously infected part, if it arose from a generally diffused state of the atmosphere?

112. Others, again, impute the pestilence to the exhalation from the bowels of the earth of some peculiar miasm. But the above arguments are equally weighty when directed against this supposition: for, independently of such exhalation being a mere assumption, as well as the foregoing, and putting out of the question the fact, that not a vestige of evidence has ever been adduced of any peculiar change of the atmosphere from its usual condition, or of any miasm, exhaled from the interior parts of the earth, having been observed simultaneously with the appearance of the malady, these causes, even if they did exist, could not account for the specific and uniform characters which it has always presented, in every situation, temperature, and elevation above the level of the sea, in all latitudes and longitudes, and from its commencement constantly up to the present time. A distemperature of the air, whether from foreign gases, electrical states, or whatever other cause, surely could not for such a

period, or under such a variety of circumstances, be so uniform and specific. Exhalations from the interior of the globe, whether proceeding from a great internal fire, from the action of circumambient agency, solar or lunar, or both, or from the electrical changes taking place in the more interior masses and constituents of our planet, surely could not, in all places, at all periods of this epoch, at all elevations, and under every combination of circumstances, be so uniform in their effects, so specific in their action, as the character of this pestilence shows its exciting cause to be.

113. If a noxious exhalation, proceeding from the more interior parts of the globe, caused the disease, it must on some occasions have risen through the depth of the ocean to have affected the crews of ships. Could this have taken place without it being changed by the medium through which it passed?

114. Where we find a distinct agency — a specific effluvium, exhaled from the bodies of the affected, of which we have certain proofs, not merely as respects the manner of its operation, but also as regards its impression on several of our senses — wherefore should we have recourse to suppositious essences and to vain imaginings, to account for the propagation of the disease?

115. It may be supposed that more space has been devoted to this part of the subject than it deserves. It is, however, of the most transcendent importance; for upon accurate views respecting it altogether depends the success of measures to prevent the extension of the pestilence, and even to remedy it where preventive measures have failed. Besides, as this pestilence is placed in the same category with true yellow fever and the plague, both by those who argue for and by those who argue against infection, the evidence for or against this property in respect of it applies also to the others.

116. Having devoted much attention to the phenomena of this pestilence, and to the circumstances characterising the dissemination of it, and having had extensive experience in it during its prevalence in this country*, I proceed very succinctly to state the conclusions at which I arrived as to its causation and propagation.

117. (*a.*) The distemper was caused by infection, which was traced in many cases — in most of those which I saw in private practice: it was manifestly infectious according to the definition I have given of INFECTION, in the article devoted to the consideration of this topic (see § 3, *et seq.*).

118. (*b.*) It was not caused or propagated by immediate or mediate contact — by a consistent, manifest, or palpable virus or matter; but by an effluvium, or miasm, which, emanating from the body of the affected, and contaminating the air more immediately surrounding the affected person, infected the healthy who inspired the air thus contaminated, especially when predisposed in the manner above shown (§ 99.).

119. (*c.*) This morbid effluvium or seminium of the distemper — this animal poison emanating from the infected — was often made manifest to the senses of smell and even of taste; it attached itself to the body and bed-clothes; remained so attached for lengthened periods, if these clothes were shut up in confined places; and reproduced the disease when the air respired by predisposed persons was contaminated or infected by the clothes imbued by the effluvium or poison.

120. (*d.*) The disease was thus propagated in numerous cases; and, as I was convinced, in my own person, even by the clothes of the physician, without himself becoming affected. An infected or contaminated air — infected in the way just shown — caused an attack, without immediate or mediate contact, which was entirely innocuous, provided the air contaminated by the affected person was not inspired.

121. (*e.*) Placing the hand upon any part of the surface of a person in the cold or blue stage of the distemper was often followed by a peculiarly unpleasant or tingling sensation in the course of the nerves of a healthy person, but this would not occasion infection, if breathing the contaminated air surrounding the affected was avoided.

122. (*f.*) When the poisoned air was breathed by a healthy person for the first time — especially the unpleasant air in the wards of a cholera hospital, or that surrounding the dead body, or that contaminated by the evacuations, a morbid impression was often felt and referred to the chest and epigastrium, giving rise to frequent forcible inspirations or expansions of the chest. This impression and its immediate consequences generally disappeared after a recourse to stimuli, or full-living; but were followed by some grade or other of the distemper if other depressing agents, as fear, &c., or high predisposition, favoured their developement.

123. (*g.*) On occasions of subsequent exposure to the efficient cause of the malady — of breathing the infected air — this morbid impression was somewhat less manifest; and each successive exposure was followed by less evident effects, unless the morbid effluvium was more concentrated in the respired air.

124. (*h.*) The operation of the morbid effluvium or animal poison was violent in proportion to the concentration of it in the air respired, and to the weakness of the person inspiring it, and to the grade of predisposition.

125. (*i.*) There is no evidence to account for the generation of the choleric poison in the first instance, and there is as little of its reproduction *de novo*, on subsequent occasions. It is also impossible to form a correct idea of the period during which the infectious miasm or seminium may be retained by clothes closely shut up from the air, or by the dead and buried body, and be still capable of infecting the healthy.

126. iv. *The disease considered in relation to its exciting cause, and the effects of this cause on the vital functions and blood.* — The intimate relations and nature of this pestilence can only be inferred from a careful examination of symptoms or phenomena, in connection with their exciting cause, and with its effects, both direct and consecutive, upon the frame. The uniformity of the symptoms, under every circumstance of locality, climate, and constitution of the affected, would point, as stated above (§ 53. 95.), to one specific or principal cause. But in what does this consist? The manner of the

* On the introduction of the pestilence into this country, I was desirous of observing it in the cholera hospitals within my reach, especially in those first established; and my friends at the Privy Council Office furnished me with every facility in accomplishing my intention. I saw also many cases in private practice, both in my own vicinity and in various parts of the metropolis and suburbs.

attack, the selection observed in its victims, the circumstances connected with the seizure, the characteristic symptoms which it presents, and various other considerations, strongly indicate, independently of the evidence adduced in proof of it, the existence of some animal poison or effluvium proceeding from the diseased and infecting the healthy. But in what way this poison, or leaven of the disease, first originated, there are no certain data from which to venture an inference. Did it originate about the period of the first irruption of the pestilence in the Delta of the Ganges, and propagate itself by extending its influence to the predisposed ever since, without any subsequent generation of the principle *de novo*, assuming more destructive features under circumstances which predispose to, or facilitate its transmission, as moist, unhealthy, or epidemic states of the air, &c.? Or does this disease arise in distant and unconnected places at nearly the same time, from some peculiarity of the air, or of its electrical states, or from some foreign material extricated from the earth, or floating in the atmosphere; and, having produced the fully formed disease, an effluvium emanates from the affected body, capable of inducing the same train of morbid actions as those in which itself originated, the infectious principle being thus generated *de novo* on numerous occasions? That an infectious property is evinced by the disease cannot be doubted by any one who intimately examines its phenomena, particularly in connection with their origin, or who has attended to his own sensations during and after respiring air contaminated by the effluvium from the sick, or after inhaling the miasms from the excretions or from the bodies of the dead; but whether this principle originated with the first irruption of the malady, or has been reproduced on numerous occasions subsequently, the disease which reproduces it proceeding from a very different cause, is a difficulty which will not readily be solved. It cannot be believed, however, that, where the symptoms of the disease are uniformly the same, the causes which occasion it should be so entirely opposite as are aërial influence and an animal poison generated in the bodies of the diseased; or in other words, that very different and very opposite causes should be *uniformly* followed by the same effects on every occasion and combination of circumstances, the disease at the same time generating a cause which shall perpetuate it, of a very different nature from those in which itself originated. Indeed we have no evidence of the reproduction of this principle in distant and unconnected places, from causes different from itself, inasmuch as there is no evidence of the disease having ever appeared under such circumstances, or, in other words, without communication with previously infected places; and hence we have no right to infer that a contingent combination of causes will reproduce this principle, until we have evidence to show that it does.

127. But in whatever way this question may be answered, if indeed it be ever satisfactorily answered, is not very material, as respects the nature of the malady. Whatever may be the exact origin of the efficient cause, there seems little doubt that it is inhaled into the lungs with the inspired air, where it acts as a poison, depressing the energy of the nerves supplying this organ, destroying the expansile actions it performs during respiration, and impeding those changes which the blood undergoes in the lungs. That the vital energy of the nerves distributed to the respiratory, the circulatory, and the secreting organs is either uncommonly depressed or entirely annihilated, is shown by the nature of the characteristic symptoms constituting the malady. The state of the respiratory function, particularly the laborious inspirations and rapid expirations, the coldness of the expired air, the involuntary and forcible retraction of the epigastrium and hypochondria, and the inexpressible oppression and anxiety referred to the chest, all indicate that the vital actions of the lungs are nearly suspended, and that the state of collapse and congestion, presented by them soon after death, had actually commenced during life. The impaired actions of the heart, the small, weak, and nearly abolished pulse, and the black colour of the blood, evince a suspension of those changes produced upon this fluid during respiration, and demonstrate not only a paralysis of the nervous energy of the lungs, but a marked diminution of the nervous power actuating the heart and arteries; the loss of vital or nervous power being necessarily followed by a suspension of the changes produced upon the blood in the lungs, by congestion of the abdominal viscera, by an exudation of the watery or serous part of the blood from the digestive mucous surface, and the discharge of it from the stomach and bowels, and by a total cessation of all circulating and secreting actions, owing to the loss of organic nervous power, and to the change in the state of the blood. The vital or ganglionic class of nerves (which forms a sphere of intimate union with each of its parts, supplies the lungs, the heart, and blood-vessels, and all the digestive, assimilating, and secreting viscera, and when powerfully impressed in any one part experiences a co-ordinate effect throughout the whole), is primarily and chiefly affected. Hence the alteration of all the natural secretions so rapidly supervening upon the morbid impression made by the efficient cause of the disease on the nerves of the lungs,—hence the almost total abolition of circulation, assimilation, and secretion, — hence the congestions of the large vessels and vital organs,—and hence also the rapid extinction of voluntary power, as a necessary consequence of the suspension of those changes which, being produced in the blood, support the nervous energy and all the voluntary and vital actions. The retchings, evacuations, and spasms so generally observed, frequently follow upon any sudden diminution of vital power, and upon congestions of the nervous centres, and seem to answer wise purposes in the economy, inasmuch as they tend, by their influence on the circulation, to bring about a natural restoration of the vital actions, and to throw off the injurious load by which the springs of life are oppressed. They are efforts of nature to expel what is injurious, or to rally what is sinking. Where the powers of life are not too far reduced, these efforts will be energetic and often successful, as very frequently remarked in respect of the less dangerous cases of this pestilence; but when the vital energies are far sunk, or where the serous portion of the blood is so far drained off by the digestive mucous surface as to render the blood

unfit for circulation in the capillaries, these efforts will generally prove weak and inefficient, even when assisted by rationally devised means.

128. Whatever may be the exact nature of the exciting cause, and whatever may be its mode of operation on the frame — whether this cause primarily affects the organic nervous system, and the blood consecutively through the agency of this system, as now maintained, — or whether it passes at once into the circulation from the air-cells of the lungs, and affects the organic nervous system secondarily, — there cannot at least be any doubt of the very remarkable changes produced on the blood in the course of the distemper. The analyses of the blood, of the bile, and of the evacuations by M. LE CANU, Dr. O'SHAUGHNESSY and others, show that, at an advanced period, the blood has lost one half of its serum, a considerable portion of its fibrine, and most of its carbonate of soda; whilst the rice-water-like evacuations consist chiefly of the serum of the blood, containing albumen, and carbonate of soda, and other saline ingredients which are deficient in the blood. When the disease has gone on to the febrile or reactive stage, then urea accumulates in the blood, and even in the bile, owing to the paralysed state of the kidneys. It is not improbable that a considerable change is going on, in a latent manner, in the blood before the serous portion of it is discharged from the digestive mucous surface; and that this change takes place chiefly in the lungs, and affects the vital relations subsisting between the serum, fibrine and coloured globules, as well as between the capillary vessels and blood circulating through them; and that the fully developed period of the malady is the result, — 1st, of this change, and 2d, of the evacuation of the serum, and other ingredients of the blood; capillary circulation in vital organs thereby becoming arrested. This state of the blood, in connection with the impaired functions of the lungs, of the kidneys, and of the liver, is evidently the source of the consecutive fever.

129. It has been now shown, both by reference to the appearances displayed by investigations after death, and by connecting these with the phenomena presented by the disease during life, that the requisite changes are not produced upon the blood by respiration; and that the emunctories, which remove from the circulating mass those materials which would prove highly injurious and irritating to the frame if they were allowed to remain in it, have their functions entirely suspended; whilst, at the same time, the serous portion of the blood escapes from the digestive canal in so large a quantity as to change the physical condition of the blood in the vessels, and thereby to interrupt the circulating functions in vital organs. Can it, therefore, be a matter of surprise, that, when reaction of the vital powers of the system is brought about, very great disturbance, not only of the circulating system, owing to the altered state of the blood, but also of the encephalon, and of the different emunctories, is immediately manifested? Indeed these consecutive states of disease, which have been well illustrated by observation, are entirely in accordance with *à priori* inferences in pathology.

130. I conclude this part of the inquiry by stating the inferences which may be drawn from an extensive view of what is known of this pestilence, as it has appeared in Asia and in Europe, and from intimate observation of its phenomena, as they lead to various considerations calculated to arrest its progress and to remedy it, when an attack has not proceeded too far in the destructive processes in which it has been shown to terminate.

131. *A.* The pestilential cholera seems to have been propagated by an animal miasm or effluvium of a peculiar kind, emanating from the bodies of the affected; and this effluvium, being inhaled with the air into the lungs, paralyses these organs, and acts as a poison on the class of nerves which supplies the respiratory, the assimilating, the circulating and secreting viscera, vitiating also the whole mass of blood, and thereby occasioning a specific disease, which in its turn gives rise to an effluvium, similar to that in which itself originated; which, also, in like manner perpetuates its kind, under the favourable circumstances of predisposition, aërial vicissitudes, &c., and thus a specific form of disease is propagated far and wide, as long as predisposing, concurrent, and determining causes favour its propagation.

132. *B.* The morbid impression of this effluvium or poison upon the nerves of organic life, and probably the effect of its introduction also into the current of the circulation, are of a sedative kind, rapidly destroying the vital energy of the former, and vitiating the latter, and thereby giving rise to the characteristic phenomena of the malady.

133. *C.* The impression of this effluvium on the organic class of nerves, and the vitiated state of the blood, may be viewed as the proximate cause, not only of the disturbance evinced by the respiratory, the secreting, the assimilating, and the circulating functions, but also of the morbid actions of the stomach and bowels, and the copious serous discharges from these organs, as well as of the muscular spasms, the sinking of all the vital and animal powers, of the shrunk and collapsed state of the surface of the body, of the black, thick state of the blood, and of the rapid depression of the animal temperature.

134. *D.* The states of the perspiration and skin, and the discharge of the serous portion of the blood by the stomach and bowels, imparting the peculiar appearance of the evacuations, proceed from the alteration primarily produced in the vitality of the frame and in the condition of the blood; and it is chiefly through the medium of the cutaneous surface, of the liver, of the kidneys, and of the mucous membranes, assisted, perhaps, also by the other secreting viscera, that the morbid change of the blood is remedied, and impurities removed from it.

135. *E.* The advanced stages, or the consecutive, or febrile symptoms of the disease, whether those chiefly depending upon the state of the nervous functions, or of the circulation within the brain, or proceeding from the condition of the abdominal viscera, arise partly from the shock received by, and the depression of, the vital energy of the frame in the early stage, partly from the congested condition of the large veins and important viscera, and partly, if not chiefly, from the alterations which had taken place in the blood during the early stages of the malady.

136. *F.* The effluvium or seminium, which propagates the distemper, is generated in the progress of the changes produced in the blood,

and is emanated or discharged from the mucous surfaces of the lungs and digestive canal, and from the cutaneous surface, along with their respective exhalations and excretions; and this seminium, by contaminating the surrounding air, or woollen cloths and animal products, capable of attracting and retaining for a time animal effluvia, as shown above (§ 92.), affects those of the healthy who are predisposed, either constitutionally, or by antecedent, concomitant, or determining influences, or on whom this efficient agent acts in an intense or concentrated form, or is aided by accessory or concurrent causes.

137. VI. TREATMENT OF PESTILENTIAL CHOLERA.—The means of cure which should be employed, in order to secure even a moderate share of success, ought to be appropriately prescribed, and strictly directed to the various pathological states and stages which the disease presents in different habits and constitutions, and in its various grades of severity. It is, in some measure, owing to a neglect of this strict appropriation of the numerous plans and means of treatment recommended, and to the empirical manner in which they have been administered, that opinions have been so different as to the utility of the greatest number of them, even at an early period of the malady; at a far advanced stage, very few remedies indeed have hitherto been employed with any remarkable benefit. In order that the means chiefly depended upon by the numerous writers on this malady may be more strictly referred to the circumstances under which they seem to be indicated, and often to have really proved beneficial when early employed, I shall *first* succinctly state the chief forms and stages of the disease, with reference to various grades of intensity, and existing pathological conditions; I shall *next* briefly notice the methods which have been employed by various authors; and, *lastly*, detail, with strict reference to these different states and stages, the treatment I venture to recommend, according to my own experience and observation.

138. i. *Grades and stages of the malady, with reference chiefly to curative measures.* The mode of attack, as well as the severity of the disease, vary materially, according to the intensity of the exciting cause, the nature of the concurrent causes, the state of predisposition, and the strength of the patient's constitution.

139. *A.* The INVASION of the disease generally presents itself in *three* different grades, owing to the above causes.—*a.* The *first* and least dangerous grade or state of invasion is the most gradual, and is usually that of a common diarrhœa, varying in duration from a few hours to one or two or even more days, accompanied with oppression in the chest, and anxiety at the præcordia, and collapse of the countenance and surface of the body. If these symptoms be neglected, they soon pass into those characteristic of this malady, viz. marked and sudden loss of pulse; oppressed and difficult respiration; muscular spasms or tremors; shrunk, wet, and leaden appearance of the surface and extremities; sunk eyes, and watery vomiting and purging, with great distress. This is generally the *least severe* form of the malady, and is commonly met with in the younger and more robust class of subjects. For the sake of distinction I shall term it the slightest grade, or that characterised by premonitory diarrhœa, &c.

140. *b.* The *second* state of invasion is the most frequent, and is generally ushered in by cerebral symptoms, such as giddiness, noise in the ears, by a remarkable oppression of the chest, weight at the epigastrium, and a great depression of the pulse and of all the vital energies, rapidly followed by spasms, commencing at the farther parts of the extremities, and accompanied with watery purging and vomiting, and all the symptoms described above (§ 28.). This is the common form or degree of severity of the malady.

141. *c.* The *third* state or form of invasion is the most sudden and fatal. The patient is suddenly seized, as if struck by lightning, or by a severe blow on the epigastric centre. His vital powers are immediately laid prostrate; inordinate discharges of serous fluid take place from the bowels and stomach, with cramps and spasms of the voluntary muscles; and he is usually found without pulse at the wrist; with most laborious respiration; shrunk, purplish, raw, wet, and cold condition of the surface of the body; and collapsed, terrified state of the countenance. This *severest grade* of the malady generally seizes on the old, the debilitated, or most highly predisposed persons; and often terminates life in a few hours, with a most rapid and continued sinking of all the functions.

142. This *last* form or state of the disease is generally beyond the reach of medicine; it is chiefly in the two former that medical means avail. These *three* modes of invasion and grades of the distemper should be distinctly borne in mind, as requiring very distinct and decisive modes of cure. Besides attending strictly to these STATES of the disease, as indicated chiefly by the modes of its INVASION, the practitioner is required to notice attentively

143. *B.* THE PERIODS OR STAGES which mark its course. *a.* The *first* or premonitory stage, or the incipient state of diarrhœa, during which, in addition to much vital depression and imperfect discharge of the vital and natural functions, the serous portion of the blood is being effused from the digestive mucous surface, constituting, as well as the more sudden and rapid effusion of serum, a serous hæmorrhage from the digestive canal.

144. *b.* The *second*, or the cold and blue stage, is that of *extreme depression*, the symptoms indicating the utmost sedative effect of the exciting cause of the disease on the vital powers, with a morbid state of the circulation. The extreme degree of this period constitutes the *third*, or severest form of the malady (§ 29. 141.), it being so marked as to entirely overwhelm life in a short time, without any other period or stage supervening.

145. *c.* The *third period* is that of morbid reaction, and is evinced by returning warmth and pulsation, and diminution of the leaden state of the surface. It passes either into convalescence, or into exhaustion and disorganisation. This period, as stated above (§ 29.), may not appear in the severest forms of the disease. But when it does supervene, it presents the symptoms already described, when treating of the consecutive phenomena of the malady (§ 33.). In many instances, life is not destroyed by the morbid state forming the first period of the disease; nor is it so completely overwhelmed as to prevent all reaction; but the reaction which is produced, being accompanied with the morbid state of the blood,

the principal part of its serum being lost, and with a considerable share of the congestion of vital organs characterising the preceding period, is necessarily imperfect, and readily passes into an adynamic state of sub-inflammatory action, affecting chiefly important and vital organs, and often assuming the form of malignant fevers complicated with visceral disease.

146. *d.* The *last stage*, or that of exhaustion and disorganisation, is always a consequence of attempts at reaction, which are, however, often imperfect and extremely morbid in their nature (§ 33, 34.), owing to the marked impression made by the exciting cause on the vital energies, and chiefly to the very evident deterioration of the blood. This stage takes place more or less rapidly, and, when once present, the fatal tendency is great, and is very rarely arrested by treatment. In a very large proportion of cases, the febrile symptoms arising from reaction, are accompanied with more or less of congestion or of a sub-inflammatory state of some vital organ, frequently of several, as of the encephalon, alimentary canal, liver, lungs, &c. and when the consequent collapse terminates in death, these organs manifest the nature and extent of their disturbance.

147. It should be kept in recollection that the *third stage*, or that of reaction, as well as its consequences, namely, exhaustion and disorganisation, can only occur in the *first* and *second* grades of the disease, or in those cases which have not proved fatal from the *second*, or cold stage. The *third* stage is identical with, and presents the phenomena described as forming, the consecutive states of the disease (§ 33.). Owing to the important features it often assumes, it requires a more particular notice.—1st, A congestive and sub-inflammatory state of the encephalon and spinal marrow, assuming the characters of typhoid, or malignant nervous fever, and proving the most frequent and fatal form of the second period.—2d, a bilious or bilio-nervous form of fever.—3d, a sub-inflammatory state of the stomach, or of the bowels, and frequently of both conjoined. And, 4th, an irritative or sub-inflammatory state, with congestion of the lungs, accompanied with oppression and pain in the chest, cough, and viscid expectoration.

148. The *exhaustion* into which these stages gradually pass, and which forms the fourth or last stage of the malady, is generally attended by symptoms indicating more or less congestion, particularly of those organs which manifested the chief disturbance during the period of re-action. Its accession is often rapid. It requires to be accurately recognised and promptly met, in order to ensure any share of success in combating it; and even then success very rarely results.

149. When death occurs in the first stage, as it often does in the highest grade of the disease, the chief changes are observed in the blood, the lungs, and vascular system (§ 43. 45.), the vital functions being so rapidly abolished, from the impression of the exciting cause of the malady, that the morbid influence can be evinced only on this system, and there chiefly as respects the state of the circulating fluid—a sufficient length of time to produce disorganisation to any very remarkable extent not having elapsed between the invasion and termination of the disease. But when death takes place after the period of reaction, organic changes are observed in various important viscera (§ 46.), which, however, with the disturbance of vital functions, and in which they chiefly originate, only partly account for the fatal result. The thick and venous states of the blood, owing to the remarkable loss of serum and to the arrest of the changes produced by respiration on the blood, manifestly interrupt the capillary circulation in vital organs, and occasion the phenomena of the advanced stages of the distemper, and ultimately death.

150. It will be necessary to acquire precise ideas of the foregoing *forms* and *stages* of the malady, in order to devise appropriate means for counteracting their fatal tendency.

Synopsis of the Forms and Stages of Pestilential Cholera, depending upon the severity of attack.

First grade.—With marked premonitory symptoms, particularly diarrhœa, &c. (§ 26. 139.).	*First stage*, or preliminary diarrhœa, which may be readily arrested without further disturbance beyond indigestion, &c. *Second stage*, or that of extreme depression or failure of the circulation (§ 28.), often quickly passing into dissolution, but sometimes followed by the
Second grade.—Commencing with giddiness, faintness, &c., rapidly followed by the characteristic features of the disease (§ 28. 140.).	*Third stage*, or reaction, or febrile affection, with suppression of the urinary and biliary secretion (§ 33.). *A.*—Reaction with typhoid, or maligno-nervous febrile affection (§ 34.). *B.*—With gastro-enteric affection, &c. (§ 35.). *C.*—With bilious affection, &c. (§ 35.). *D.*—With pulmonary affection, &c. (§ 35.). *E.*—With two or more of these conjoined. *Fourth stage*, or that of vital exhaustion and disorganisation, often terminating in death.
Third grade.—The seizure sudden and intense (§ 29. 141.).	Most frequently consisting of the stage of depression only, rapidly terminating in death, and more rarely followed by reaction and the stages and states above enumerated.

151. ii. *Notice of various Modes of Treatment employed in different Countries.*—M. BENOIT states, that he found the combination of camphor, laudanum, and sulphuric æther, with the external use of sinapisms to the epigastrium and extremities — means employed by numerous practitioners,— successful in the visitation of the pestilence at Manilla, in 1820. Mr. CRAW (*Bombay Reports*)

speaks very favourably of large doses of ammonia and musk. Dr. PEITSCH (*Fodéré*, p. 261.) states that his practice in Java showed the uncommon efficacy of two parts of spirits of mint, one part of spirit of lavender, and one of laudanum, taken in doses of a spoonful, until the vomiting ceased. Mr. MILWARD (*Bomb. Rep.*) informs us that he found magnesia, in doses of four scruples, remain in the stomach and procure natural evacuations, other means having failed. Dr. MAHIR, of the Polish army, employed large doses of opium and prussic acid, with lavements of assafœtida. Several physicians in Russia, Poland, and Germany, had recourse to moxas, or the actual cautery applied either along the spine, or on the scrobiculus cordis, but with as much benefit as may rationally be expected from such means. Many of the physicians at Warsaw ascribed good effects to the magistery of bismuth, whilst others stated it to be more injurious than beneficial.

152. The treatment which was recommended by Mr. CORBYN, and very generally adopted in India, consisted of from fifteen to twenty grains of calomel, washed down with sixty drops of laudanum, and twenty drops of the oil of peppermint, in two ounces of water. He prescribed full blood-letting in Europeans, and repeated the above medicines every three hours, until relief was obtained. The oils of peppermint and cajuput were very generally used in India, and they seem to have been frequently serviceable, but as adjuvants merely.

153. Mr. ANNESLEY confiding in blood-letting employed early in the disease, and in large doses of calomel, with moderate quantities of opium, followed by warm stimulating purgatives. His object in prescribing these medicines was to remove the tenacious muco-albuminous matter lining the internal surface of the intestines, which he viewed as obstructing the canal. But he ascribed undue importance to a change contingent upon the advanced stage of the malady, the existence or removal of which could but little affect the course of the malady.

154. Mr. SEARLE advised the patient to be placed between very warm blankets in an airy apartment; and, as he considers a deranged state of the stomach is generally connected with the origin of the attack, the free evacuation of this organ to be amongst the earliest intentions to be fulfilled. For this purpose he recommended, whether the patient has vomited or not, that he should drink freely of warm water in which common salt has been dissolved, — about a tablespoonful of the salt to half a pint of hot water; that bleeding should be practised, and, after the stomach is evacuated, that a full dose — about twelve grains — of calomel, be exhibited, and washed down with hot brandy and water, and that this be repeated every hour or two, until an improvement is observed, when it may be given in smaller doses, and either in conjunction, or alternately, with some mild aperient. For the sub-inflammatory states of the encephalon, or abdominal viscera, frequently supervening during reaction, or the third stage of the malady, he recommends the employment of moderate, general, and local depletion, with injections and counter-irritation, by means of sinapisms. He found the cramps relieved by compression.

155. Mr. GOSS, of the East India Company's service, states, that hearing the patients complaining of the excoriating nature of the fluids evacuated, he suspected this property to depend upon the presence of some acid, and that he therefore exhibited about a drachm of the carbonate of soda with fifteen grains of the carbonate of ammonia; the patients, who were very few, and their cases slight, all recovering under this mode of treatment. He likewise had recourse to full blood-letting, occasional doses of calomel and jalap, to frictions and counter-irritants applied to the abdomen and lower extremities. He states that emetics had failed in some instances in which he had employed them, but had succeeded in others. He appears to have employed the ipecacuanha powder merely, without combining it with diffusible stimuli, and therefore his failure in the most severe cases was to be expected.

156. Dr. RAIMANN, of St. Petersburgh, states, that blood-letting, with calomel and opium, and external heat and irritation, were amongst the most successful means employed against the disease in Russia. Warm baths were of equivocal service, unless at the very commencement of the seizure, or in the slightest cases. They generally exhausted the patient instead of restoring the circulation to the surface in the more severe cases.

157. M. VOS, who practised in Batavia, found blood-letting of service amongst Europeans only: it was injurious in the natives. The remedies from which he derived the greatest advantage were calomel with opium, followed some time afterwards by warm stomachic purgatives and injections. M. MARGEOT, who observed the disease in the Isle of France, prescribed, every two hours, two drachms of the sulphate of soda in a glass of honey-water, until bilious evacuations appeared. He gave diluents liberally, and administered emollient injections frequently, with the view of promoting the action of this salt. M. ROBERT, who adopted this practice, added to it the occasional exhibition of a draught with ammonia; and M. GALDEMAR employed a draught with olive oil, sulphuric ether, and camphor.

158. Mr. BOYLE, who treated the disease in India soon after its first appearance, finding, in the post mortem examinations which he first made, that the gall-ducts were obstructed by a thick viscid bile rather than by spasm, was led to exhibit emetics and procure full vomiting, in order to remove this obstruction of the passage of bile to the duodenum; and the advantages which he obtained from the practice induced him to recommend it in preference to other means which he considered subordinate to it, and requiring to be varied according to the circumstances of individual cases, the use of emetics being always requisite. To this gentleman the credit is due of having been the first to recommend emetics for this disease.

159. Several of the American practitioners who had visited India and China during the prevalence of the pestilence, prescribed powdered carbon and burned cork in milk, and conceived that benefit resulted from the practice. This substance, however, as well as many others to which a certain degree of credit was attached, only seemed of advantage, it being apparently successful in the slighter cases of the disease, in which the morbid actions induced in the frame operated their own cure, through the aid of the powers of

the constitution. This practice, however, was strongly recommended by Dr. JACKSON, an authority of the greatest weight, in dysentery and chronic diarrhœas, in which affections it appears to have been extremely serviceable.

160. When the disease appeared in Persia, the native practitioners had recourse to cold affusions, and cold acidulous, or iced fluids, of which the patients were allowed to drink at will. At Bussorah, M. MORANDO prescribed cold applications over the organs chiefly affected, at the commencement of the attack, and blood-letting, both general and local. M. MEUNIER, at Bagdad, treated the disease by means of venesection, leeches applied to the pit of the stomach, mucilaginous and opiated draughts and injections, and hot fomentations. A similar practice to this seems to have been very generally adopted by medical men in Syria, Mesopotamia, and Aleppo. Of the effects, good or bad, of the cold affusion as adopted in Persia, I can find no precise information. But, judging from the great benefit I have seen derived from the cold affusion on the head, in cases of poisoning by opium, even when life, apparently, is nearly extinct, this practice seems to me not so irrational as many may suppose. It is at least one of the most energetic means with which I am acquainted of removing congestion of the vessels within the head.

161. When the disease appeared at Astrachan, in 1823, the medical commission prescribed the following practice:—A large blood-letting; a dose of calomel, with sugar or gum Arabic, and followed by from forty to sixty drops of laudanum; twenty drops of the oil of peppermint, given in two ounces of the aqua melissæ; frictions of the epigastrium, with an ammoniacal liniment; scarification and cupping over the abdomen; frictions of the limbs and surface generally with camphorated spirit; mucilaginous injections with about thirty drops of the tincture of opium, and calomel in doses of from ten to twenty grains. This practice, which was altogether based on that very generally employed in India, was likewise adopted when the disease invaded Russia in 1830; but on this occasion blood-letting was found less beneficial than formerly, and warm sudorifics, and the external application of heat, were more depended upon.

162. Dr. KEIR, who had great experience of the disease at Moscow, derived advantage from blood-letting in the young, plethoric, and well-fed, and in the common or intermediate grades of the malady, particularly when employed early, or before the pulse left the wrist. In the most intense grade, or when resorted to late, or when the pulse had disappeared from the arm, it often seemed prejudicial. Full doses of calomel with opium, followed by stimulants, purgatives, and injections, and accompanied by the external and other means usually employed by the Indian practitioners, formed the principal part of the treatment adopted by him.

163. When the pestilence appeared in Warsaw, the medical authorities there had recourse to very nearly the same treatment as stated in the preceding paragraph (§ 162.). Subsequently, many adopted, and several afterwards relinquished, the plan of Dr. LEO, which was to give three or four grains of the sub-nitrate of bismuth every two hours. According to M. BOUSSEAU, the hydrocyanic acid, the hydrocyanate of zinc, oxygenated water, and oxygen gas, were all tried in this city without benefit; and, I may add, that laurel-water, phosphorus, both internally and externally, moxas, and the actual cautery to the spine and epigastrium, were also made trial of without any remarkable advantage. M. BRIERE DE BOISMONT recommended (when vomiting continued urgent) the cuticle to be removed by means of liquid ammonia, and the denuded surface to be sprinkled with one or two grains of the acetate of morphine.

164. Mr. FINLAYSON derived advantage in one case in Ceylon, from passing a galvanic current through the lungs. Galvanism certainly deserved a fair trial in this disease; but the instances in which it was resorted to in this country did not furnish evidence of its success.

165. Dr. BARRY, having very frequently observed congestion, inflammation, and softening of the spinal marrow, in a greater or lesser degree, in his examination of fatal cases of the pestilence, was led to recommend the application of the actual cautery to the back, opposite the lower dorsal and upper lumbar vertebræ; it had been employed on the Continent with some success. He also advised full vomiting, and for this purpose preferred a strong solution of common salt and water, given in doses of six ounces. Warm, dry applications to the skin, and continued friction, he considered very beneficial, whilst vapour and hot-water baths he believed to be worse than useless. Bleeding, as well as large doses of either opium or stimulating liquors, he believed to be dangerous in the utmost state of depression, when the powers of life are reduced to the lowest ebb, and consequently easily annihilated; but previous to this state, or when reaction is supervening, he considered blood-letting beneficial to the patient.

166. The following account of the experience of several physicians at Warsaw, abridged from that given by M. DE BOISMONT, is important, as showing the results of different kinds of practice:—

Dr. JANIKOWSKI treated sixty-six cases. He bled the robust and those with evident congestion, and gave every three hours two grains of calomel, with one of opium, with warm stimulating diluents, sinapisms on the epigastrium, and frictions of the limbs with irritating liniments. In some cases he gave the nux vomica in doses of half a grain, every fourth hour, in an emollient decoction, and, he conceived, with some advantage. He lost twenty, chiefly old persons, of the number treated. Dr. KOEHLER had sometimes recourse to blood-letting, but depended more upon the preparations of ammonia. He also prescribed calomel with opium, and in some cases large doses of the sub-carbonate of potash. The further results of his experience are not given. M. LE BRUN treated about sixty cases, of which he lost nearly one-half. The disease was, however, far advanced before they came under treatment. He confided chiefly in blood-letting, warm diluents with opium, and camphor combined with calomel. Of twenty cases treated in private practice, five died. The remaining forty were hospital cases. Dr. ENOCH treated forty-three cases, of which five were hospital patients. He lost only seven cases, chiefly aged persons. The most of his patients were blooded, and treated with calomel

and opium at first, and afterwards with calomel and rhubarb. He directed sinapisms to the epigastrium and extremities. Dr. Jasinski treated thirty cases, of which ten died. In his earliest cases he employed blood-letting when he thought it indicated, or leeches to the painful part of the epigastrium, with small doses of calomel and opium, and the infusion of valerian. In the cases which occurred subsequently, and which were generally more intense, he prescribed leeches to the abdomen, the magistery of bismuth internally, and sinapisms and frictions to the extremities. Dr. Kaczkowski, physician-in-chief to the Polish armies, had recourse in the most severe cases to large blood-lettings, to calomel in doses of three or four grains, with half a grain of opium, every two hours, with the external use of sinapisms, stimulating cataplasms, moxas, &c. He also frequently prescribed, every two hours, small quantities of Dover's powder with mint ptisans, and large doses of magnesia; and states that he derived advantage from the nux vomica, given with the mucilage of gum Arabic and sugar or syrup. He lost one-sixth of his patients, amongst whom, however, he seems to have included several cases which evidently either did not belong to this disease, or consisted of the slight form, or of the incipient stage.

167. Most of the individual means and plans of cure noticed above were had recourse to when the disease appeared in this country,—but generally with that want of success, especially in the severer and more advanced cases, which led to the relinquishment of them, and to the trial of other medicines and different combinations. *Bloodletting*, which had been advised both by Indian and European physicians, was resorted to, but with very equivocal benefit; for it was only in slight cases, or in an early stage of the disease, and in young, plethoric and robust persons, that it seemed to be of service; and in these either equal advantage would have been derived from other means, or recovery would have been brought about by the powers of the constitution. The same remarks apply also to the use of *opium*. This remedy could only be viewed as an adjuvant of other means, and it was often a valuable one, in aiding to check the diarrhœa, in the slighter cases and earlier stages. But, when the attack was violent, and when the collapse was great, it either failed of producing any effect, or occasioned an injurious one.

168. The failure of the more usual means led to the adoption of warm *emetics* by several physicians, especially of those consisting of large doses of mustard; or of the substances usually employed with this intention, conjoined with powerful stimulants. But in the more violent seizures, or at an advanced period of the disease, they did not appear to me to be productive of any benefit.

169. Indian practitioners, owing to their predilection to the use of *calomel*, especially at the period of the outbreak of the pestilence in India, and to the absence of bile in the evacuations, had recourse to this medicine, generally in large or very frequent doses, and in conjunction with opium. They imputed too much importance to the absence of bile, looked upon this as the chief source of mischief, instead of viewing it as a part only of the general circle of consecutive disturbance, and aimed merely at removing a symptom without directing attention to more general and important morbid conditions. In certain states, however, of the malady, hereafter to be noticed, and in certain combinations, it was often of more or less service.

170. Dr. Graves, impressed with the little efficacy of the means previously recommended, and with justice believing that it was of the first importance to arrest the discharge of the serum of the blood from the digestive mucous surface, recommended full doses of the *acetate of lead* to be given with opium—varying the quantity and frequency of the dose with the severity of the case. Previously to the publication of this method, I had been employing the *sulphate of zinc*, with opium and extract of logwood, and *sulphate of alumina*, in similar combinations, with this intention; but my experience hardly enables me to decide as to the comparative merits of either, for each was efficacious in the less violent cases, and inefficient when the collapse was extreme.

171. The saline treatment advised by Dr. Stevens for malignant fevers, with a confidence which subsequent experience has not justified, was sufficiently tried in this pestilence, and in several cases by myself. The ascertained deficiency of the saline ingredients of the blood, in the fully developed distemper, he proposed to restore by giving every half hour or hour half a drachm of sesqui-carbonate of soda, a scruple of muriate of soda, and seven grains of chlorate of potash, in half a tumbler of water. The trials which I made of this medicine did not furnish greater success than that derived from others. The state of vital action—the complete arrest put to the function of absorption from the alimentary canal, and the general relaxation of the capillaries and of the digestive mucous surface, with the consequent serous exudation, did not admit of the passage of saline solutions or fluids from this canal into the circulation.

172. Knowing the deficiency not only of the saline ingredients of the blood, but also of the serum, and believing that the deficiency could not, in the existing state of vital action, be supplied by the alimentary canal, Dr. O'Shaughnessy was thereby induced to propose the injection of saline solutions into the vascular system. The solution most generally used consisted of half an ounce of muriate of soda, and four scruples of sesqui-carbonate of soda in ten pints of water, at a temperature varying from 104° to 112° or 118°; and the whole was injected slowly, and generally during somewhat more than half an hour. Several cases which I attended were thus treated, two of them of medical men; but none recovered ultimately. Dr. Mackintosh of Edinburgh treated many in this way; and, in the institution to which he was attached, of 156 patients in whom this plan was employed twenty-five recovered. Most probably these were all hopeless cases; but, as far as I could learn, this plan was not much confided in generally in the metropolis; and was employed only as a last resource. When recovery did follow after a recourse to it in these circumstances, the event could not fail of attracting particular notice; yet, as recovery did also occur, although in rare instances, even in the worst cases, apparently from the powers of the constitution rather than from the means employed, the

degree of success evinced by this method was more or less questioned. Phlebitis, which always proved fatal, supervened in some cases.

173. The effect of the injection of the above solution into the mass of blood was always remarkable on the disease. All the symptoms subsided, or entirely disappeared, except the excessive evacuations. These, however, returned, or became still more profuse; until a very short time after the injection, the whole of the fluid had passed off by the bowels, and all the phenomena reappeared, generally with increased violence and extreme vital depression, often rapidly passing into dissolution. This circumstance shows that the disease did not merely consist in the loss of the serum of the blood; but in an alteration of the blood still more materially affecting its vital constitution, and most probably originating, as I contended in the work published in 1832 on this distemper, in the altered vital condition of the ganglial or organic nervous system, and implicating the vascular system and circulating fluids consecutively.

174. iii. *Treatment chiefly confided in by the Author after observing the effects of various means and methods.*—When the disease is prevailing in any locality, disorder of the stomach and bowels should receive early attention, and be treated with great decision. Strict attention to my own sensations during and after the impression of the morbid exhalations from the evacuations, and from the bodies of the sick or dead, and the experience of many of my friends when their attention was directed to the matter, convinced me that the morbid impression first made upon the organic nervous system was characterised by depression; and that the consequences of such depression, and of such other change in the state of this system as may have taken place in addition, were soon afterwards manifested in the vascular system, and in the several digestive, assimilating, and excreting functions, if the primary morbid impression was not removed by powerful stimulants and tonics. It is necessary, therefore, not only to develope vital resistance and action by these means as soon as the earliest indications of depression appear, but also to restrain frequent or increased evacuations from the bowels, as being the most prompt modes of preventing these changes from taking place in the blood, which soon induce the most serious and fatal results.

175. When the disease is more fully developed, it is necessary to combine our means judiciously and energetically, to bring several agents into action at the same time, to direct them to different organs and opposite parts of the frame, and thereby to fulfil, directly and contemporaneously, several intentions and indications. In all circumstances, it is requisite, even to a moderate share of success in the treatment of this pestilence, to prescribe the means of cure appropriately to existing morbid conditions—to the pathological states and stages of the malady—and not empirically, or without reference to the known operation of these agents on the diseased actions which we employ them to remove.

176. *A. Treatment in the mildest form and earlier periods of the distemper.*—(*a.*) It has been stated above (§ 27.) that the attack in its mildest form, and in young, robust, or previously healthy persons, was very frequently ushered in by diarrhœa and general depression of the vital powers, with or without nausea, vomiting, or spasms; and that, if these symptoms were removed by energetic means, that the disease generally proceeded no farther. In most cases, however, in connection with diarrhœa and depression of vital power, there was also more or less congestion of vital organs, especially of the lungs, liver, and large venous trunks; and hence it became necessary to remove this congestion, whilst we endeavoured to restrain inordinate discharges from the alimentary canal, and to allay spasm when present; the *intentions of cure* being thus—1st, To arrest purging and vomiting; 2d, To remove congestion and oppression of the viscera, and to determine the circulation to the surface and extremities; and 3d, To restore the secretions and excretions to a healthy state.

177. The first of these indications should be fulfilled by exhibiting warm astringents and stimulants, conjoined with the remedies usually prescribed for DIARRHŒA (see that article, §§ 26. 30.); of these means I have found the sulphate of zinc, with capsicum and opium, the most efficacious; especially when exhibited in frequent doses. The opium should be given in small or moderate doses, so as to support, but not to depress, the powers of life, and always with aromatics and astringents—with capsicum, aromatic confection, confection of black pepper, extract of logwood, sulphate of alumina, acetate of lead, &c. The sulphate of zinc, when conjoined with cayenne or black pepper, or with other aromatics and opium, will not readily excite vomiting. But, if an *emetic* effect be produced by the quantity thus prescribed, the circumstance will not prove injurious; but will tend to remove internal congestions, and to fulfil the second and third indications, without increasing the intestinal discharges.

178. In cases where vascular plethora exists, a moderate bloodletting may be instituted, so as to bring the mass of the circulating fluid more nearly to the state of the moving powers; but it should be prescribed with caution, and only for young, robust, or plethoric persons, and either at an early stage, or in the slighter form, of the malady. If these means do not speedily arrest diarrhœa and other symptoms, they should be aided by the application of dry warmth and frictions to the surface of the body. Dry warmth may be applied by placing the patient instantly in bed, and elevating the bedclothes around him by two or three common hoops, or pieces of whalebone, and then introducing one end of a wide tube, at the other extremity of which the flame of a spirit-lamp or candle should be made to pass; or bags of hot salt, or of hot bran or oats, may be placed around him.

179. The removal of congestion and the equalisation of the circulation will be promoted by employing assiduously, at the same time that external heat is being applied, frictions of the abdomen, chest, and thighs, with a liniment composed of two ounces each of liquid ammonia, of olive oil, and spirits of camphor, with three ounces of spirits of turpentine, and from three to six of hard soap and cayenne pepper, to which about two or three drachms of cajuput or lemon oil may be added. Or hot flannel soaked in a mixture of these may be applied over the abdomen and over the insides of the thighs, and renewed

until warmth is restored. If the attack be attended by spasms of the muscles of the abdomen or thighs, this mixture may be used either as a liniment, or as an embrocation as now advised. The external applications should be assisted by the internal administration of ether, camphor, ammonia, calomel, opium, aromatic spirits, and essential oils, either singly, or in such forms and combinations, as the circumstances of particular cases may point out.

180. If the irritability of the stomach continue, and if the attack be severe, flannels wrung out of hot water, and immediately soaked with the embrocation just now described (§ 179.), or with warm spirits of turpentine, ought to be instantly applied, as warm as possible, over the stomach and abdomen, and retained there, or renewed, until a decided effect is produced. This is the most powerful means I am acquainted with, and the most successful in procuring reaction and restoring the heat of the body.

181. The foregoing means frequently accomplish the last of the intentions of cure enumerated above (§ 176.), by fulfilling those which preceded it. But we should never consider the patient to be placed in a fair way of recovery by bringing about reaction merely, unless the suppressed secretions be also restored. It should be kept in recollection, that an early effect of the exciting cause of the disease is to vitiate the whole mass of blood, and that this morbid state can be removed only by supplying the loss of the serous parts of the blood exuded from the mucous surfaces, and by exciting and calling into active and healthy action the functions of the secreting organs, particularly those of the abdomen. In order to attain this end, large doses of calomel, followed by purgatives or aperients, are required.

182. Calomel was commonly employed in India, and generally in conjunction with opium, in some form or other, and certainly few remedies succeeded better, either there or in Europe, in allaying the vomiting, when the disease was neither unusually severe, nor too far advanced. In cases of moderate severity, and when given early in the attack, it seems to have been remarkably beneficial in restoring the secretions of the abdominal viscera, particularly of the liver; and in these, in conjunction with bleeding, it seems to have had no mean share in preventing the consecutive states of disease, into which this pestilence so frequently passed, more particularly the nervous, congestive, or malignant state of fever, sometimes supervening. Mr. OGILVY (*Bomb. Rep.* p. 210.) remarks, that where the calomel affected the mouth, the consequent symptoms of bilious fever were not observed. Its good effects will be promoted by combining it, as above (§ 179.), with camphor, carbonate of ammonia, and small, or at least moderate, doses of opium. Large doses of this last medicine are injurious in a disease, one of the chief characters of which is great depression of the vital energies.

183. If the means here detailed arrest the malady, or bring about reaction, the treatment must be greatly modified, or altogether changed. If they fail of producing either of these effects, the additional means about to be recommended for the *third* form of the disease must be resorted to (§ 200. *et seq.*).

184. (*b.*) The *third* stage, or that of reaction, being brought about, the chief intentions of treatment are — 1st. To prevent it from proceeding too far; 2d. To promote the secretions, particularly those of the liver and kidneys; 3d. To guard internal viscera from the congestive, sub-inflammatory, and disorganising states often attendant on this stage; and 4th, To promote the return of the healthy functions of the alimentary canal.

185. The above objects are obtained by the cautious employment of blood-letting, either general or local, but more frequently the latter, in this stage of the disease, particularly if it have not previously been resorted to, or when it is clearly indicated, and when the pulse is not very soft, broad, and open — states which forbid blood-letting; by calomel exhibited in the states of combination already noticed, or with ipecacuanha; by aperients or purgatives, combined with gentle tonics and anti-spasmodics, and by vapour baths. If cerebral, typhoid, or nervous affection supervene, opium, unless in small doses, and combined with camphor, or with calomel also, seems to be contra-indicated.

186. In the stage of reaction attended by cerebral symptoms, particularly if the vessels of the conjunctiva be loaded, leeches should be applied to the posterior parts of the head and temples, and purgative medicines be employed with the view of removing the congestion of, and the determination to the head, and of increasing all the abdominal secretions and excretions; and external derivatives resorted to, in order to relieve the internal viscera from the load which oppresses them. In this particular state of the disease, as well as in its early stage, active enemata are especially indicated. They should be repeated, without being discouraged by the circumstance of their not being retained. The end will be obtained at last, if we persevere in a judicious manner. I have frequently seen marked advantage derived, in this state of the disease, from the subjoined formulæ: —

No. 308. ℞ Asafœtidæ, ʒij; camphoræ rasæ, gr. xii tere cum decocti avenæ, ℥viij; dein adde olei terebinth. ʒss. ad ℥jss. Misce, et fiat enema.

No. 309. ℞ Olei terebinth. ʒj; olei olivæ, ℥jss.; camphoræ rasæ, gr. xv; decocti avenæ, ℥viij. M. Fiat enema.

187. Derivatives are of the utmost advantage in the state of reaction with dangerous cerebral affection. Belonging to this class of means, blisters and sinapisms have been most commonly resorted to, the former applied between the shoulders, the latter over the epigastrium, and insides of the thighs. M. RANQUE has strongly recommended certain rubefacient and irritating applications to the abdomen, and M. DE BOISMONT has approved of them. They are required equally during the first stage, particularly when the vomiting and spasms are very urgent, and during this period when the head is much affected. Of this class of means, the warm turpentine embrocations applied to the abdomen and insides of the thighs, as noticed above (§ 180.) are to be preferred, as being most quick and decided in their operation. The liniment already mentioned (§ 179.), or the former of the two prescribed below *, may likewise be as-

* No. 310. ℞ Linimenti saponis co.; linimenti camphoræ co. ãã ℥jss.; olei terebinth. ʒij; saponis duri, ʒij; olei limonis et olei cajuputi, ãã ʒjss. M. Fiat linimentum.

No. 311. ℞ Camphoræ, ʒij; solve in tinct. cantharid. et Tinct. capsici, ãã ʒij; dein adde linimenti sapon. co. ʒss. et gradatim, miscendo, liquoris ammon. ʒvj; olei olivæ, ʒx. Misce bene et sit linimentum.

siduously rubbed over the spine and lower extremities; the latter on the insides of the thighs only, as it is more apt to remove the cuticle than the former. When the turpentine fomentation is not used to the abdomen, the liniment may be applied to this situation. In this period of the malady the *kidneys* may not sufficiently discharge their functions, although this is not so frequently or constantly observed as in the severer grades, where this condition is one of the most dangerous that presents itself, and the most difficult to remedy. When, however, it does occur, the embrocations and liniments already mentioned should then be applied to the loins.

188. When the stage of reaction is accompanied with gastro-enteric affection, or with the additional complication of marked affection of the liver, or disturbance of its functions, or if it assume the nearly allied form of bilious fever, the external medicaments recommended above are also requisite. If the stomach and bowels are chiefly affected, the application of leeches to the epigastrium will be necessary, previous to the employment of these, or of other external or internal means; and emollient injections should be occasionally thrown up. Small doses of opium, combined with camphor and the blue-pill, or the hydrargyrum cum cretâ, may also be given from time to time.

189. Very nearly the same treatment as now stated is required when the symptoms indicate a congested or sub-inflammatory state of the liver. The application of leeches to the epigastrium and right hypochondrium; full doses of calomel given at bed-time, combined with small quantities of camphor, and an aperient draught the following morning, or a few hours afterwards; the use of warm diaphoretics at short intervals; aperient and emollient injections, and the external means recommended above (§ 187.), will generally be requisite.

190. If the consecutive affection assume a dysenteric character, leeches to the perinæum or anum, emollient and diaphoretic medicines and mucilaginous injections will be found extremely serviceable. As the dysenteric form of the stage of reaction is frequently either associated with, or dependent upon, a very acrid and otherwise morbid state of the secretions poured into the bowels, and sometimes on an affection of the liver, the occasional exhibition of a dose of calomel with James's powder, and the use of aperients, will be indispensable, in addition to the other internal and external means of cure already particularised.

191. When the stage of reaction is attended with pulmonary affection, local depletion, and the exhibition of those medicines which, while they increase the secretions of the skin and the abdominal viscera, occasion a derivation of the blood from the congested organ, will then be necessary. The most energetic of those are calomel, or the blue-pill, with ipecacuanha, camphor, and hyoscyamus, followed by active purgative draughts and injections, and the application to the insides of the thighs of the liniments or embrocation already prescribed. In these cases the decoction of senega may be given with emollients and aromatics, or the ammoniacum mixture, with liquor ammoniæ acetatis, the camphor mixture, the spiritus ætheris nitrici, and the vinum ipecacuanhæ.

192. Upon the whole, the treatment of the stage of reaction in its various forms of manifestation, as well as the state of *collapse* into which it so rapidly passes, must be directed according to sound views of morbid actions, of therapeutical indications, and of the operation and appropriate application of remedies, as in similar or analogous cases and circumstances of disease. As to the treatment of the *last period* of the malady, or that of collapse, it will be preferable to defer any remark until some notice has been taken of the treatment of the more violent forms of attack.

193. *B. Of the treatment of the severer grades of the disease.* The same objects or intentions of cure as have been recommended for the slighter grade of the malady (§ 176.), will be applicable to the early periods of the severer grades; and very nearly the same agents will be required to fulfil them.

194. Here, also, I recommend astringents and stimulants, and upon the same grounds, with the same views, and in the same or similar forms of combination as those already described (§ 177.). If the astringents chiefly confided in, more especially the sulphate of zinc, occasion or increase vomiting, the circumstance is not to be regretted. In some cases it may even be promoted, with the view of equalising the circulation and overcoming visceral congestions. In young, robust, or plethoric persons I would even propose a moderate venesection, at the same time that vital resistance and reaction are promoted by stimulants and external derivatives; by it the load which oppresses the springs of life, and prevents their reaction, is lightened, and the mass to be moved is thereby brought to a nearer relation to the state of the moving power. But while the mass to be moved is thus reduced, care must be taken to rouse the moving power by a judicious administration of stimulants, of which full vomiting, excited by the means already noticed, the application of external heat (§ 178.), hot epithems and fomentations on the abdomen (§ 179.), and frictions with hot liniments or warm cloths (§ 180.), are amongst the most efficacious.

195. Bloodletting, however, should not be attempted in persons who are advanced in life, in the debilitated, the previously ill-fed, the drunken, and in those inhabiting low, marshy, and unwholesome situations, or who live chiefly on a poor vegetable diet. Even in those from whom the abstraction of blood is admissible, the strength, habit of body, the previous health of the patient, as well as the state and progress of the disease, should be duly considered, the effects of the loss carefully observed, and the quantity cautiously regulated accordingly. Bloodletting ought never to be attempted where there appears evidence of the loss of a large portion of the serum of the blood from the alimentary canal, or when the pulse at the wrist is small and weak. At the time of its being instituted, as well as afterwards, and in those cases where it should not be practised, internal medicines should be administered, in addition to the external means already noticed, in order to rouse the energies of the nervous and vascular systems; and thereby, whilst the second and third intentions of cure are being fulfilled, congestion will also be removed. Of the various internal stimuli which have been recommended — and almost every one in both the mineral and

vegetable kingdoms of nature has been tried—the most eligible, and I believe the most successful, are camphor in large doses, opium, ether, the preparations of ammonia, the aromatic and essential oils, particularly the oils of peppermint, cloves, cajuput; the spirits of mint, lavender, cardamoms, &c.; solutions of phosphorus in ether, or in oil*; the magistery of bismuth; large doses of musk; the hot spices, and numerous warm and aromatic plants, in various forms of combination, &c. Most of those may be conjoined with the astringents already recommended (§ 177.), and taken either in the form of pill or mixture. In many cases, it will be advisable to give also stimulating beverages, especially those to which the patient has been most habituated, as any of the several spirituous liquors diluted with warm water, sugar, &c.; hock, champagne, sherry, or Madeira wine in seltzer, soda, or potash water. In this state of the disease, particularly when the depression of the vital energies is extremely great, the assiduous application of the turpentine fomentation to the abdomen, as well as of the hot liniments to the insides of the thighs (§§ 179, 180.), and the administration of injections, as stated above (§ 186), in conjunction with the internal exhibition of the stimulants now mentioned, will also be requisite, and, when appropriately prescribed, will often prove highly beneficial.

196. It is unnecessary to enter further in detail as to the treatment of the early stage of the severer grades of the pestilence. It may, however, be remarked, that in addition to the medicines already noticed, others have been employed. Amongst these the most deserving of mention are, musk in large doses, with camphor or ammonia,—infusion of valerian with camphor or assafœtida, particularly as an enema,—the decoction of guaiacum, in a similar combination and mode of exhibition,—warm infusions of rosemary, mint, and lavender, with spirit of nitric ether,—and various other vegetable infusions and essential oils. They may be exhibited either by the mouth, or in enemata.

197. (*b.*) When imperfect *reaction* occurs—for reaction is seldom or ever freely and openly developed—it presents the same manifestations, in respect of vital organs, that have been already described (§ 184, *et seq.*); and the treatment, which has been recommended as appropriate to each of the states in which this stage of imperfect reaction shows itself, is equally applicable here, and is directed to the accomplishment of the same intentions as in the first or slightest grade of the malady. The typhoid state of fever, which frequently presents itself, requires the remedies described above (§§ 186, 187.); and the congestive and sub-inflammatory states of the liver (§ 189.), stomach, bowels (§ 188.), and lungs (§ 191.), generally demand the means which are applicable to them respectively. In this state of the malady the secretion of *urine* is very generally suspended, or at least is very scanty, especially when the discharge of serous fluid from the bowels has been abundant, the blood being incapable of furnishing the fluid material of urinary discharge. The chief object of treatment is therefore to change the morbid condition of the circulation, by means of the secreting viscera, and by furnishing the stomach with a sufficient quantity of medicated or simple diluents, whence the inordinate loss of the serum of the blood may be replaced, and the functions of secretion supplied and promoted. At the same time that these views are being acted upon, those organs which suffer congestion and a sub-inflammatory state of action, arising from the depressed state of the vital powers and the morbid condition of the blood accumulated in or circulating through them, must be, as far as possible, preserved from disorganisation. This latter object is best attained by cautious local depletions, by rousing, and, at the same time, controlling the functions of the different emunctories, by expelling morbid matters from the prima via, and transferring irritation to parts which cannot be materially injured by it.

198. In this, and indeed in all stages of the disease, as long as the sensations of heat at the epigastrium and thirst are complained of, the patient should be allowed such fluids or beverages as may prove most grateful to him; and these may be made the vehicle of the medicines already advised, and taken at a temperature which is most agreeable to him—generally in small quantity at a time and frequently. I have often allowed fluids to be taken, either cold or slightly warm, with small quantities of the nitric and hydrochloric acids, when the medicines given at the time were not chemically incongruous with them. The Anglo-Indian practitioners have lauded these beverages; but I have experienced but little benefit from them unless during convalescence, when they tended to restore the torpid functions of the liver. During the period of imperfect reaction, I have found more benefit result from a liberal use of diluents containing liquor potassæ, or the alkaline carbonates, or the biborate of soda; these appearing to favour the passage of fluids into the circulation, to correct the state of the blood, and to excite the action of the kidneys.

199. During the consecutive fever, as well as at an early period of convalescence, the bowels may become torpid, and require warm stomachic aperients, such as the decoctum aloes compositum with a little cinnamon water; equal parts of the compound infusions of gentian and of senna, or the mistura gentianæ composita; and any of the preparations of mercury which the state of the patient may suggest. The "*droque amère**," a tonic aperient tincture long used amongst the Jesuit missionaries in the East, obtained much reputation in this period and grade of the pestilence, as well, indeed, as in all its grades and stages, where a stimulating aperient was indicated, and was much employed by Anglo-Indian practitioners; it was generally given in doses of half an ounce to an ounce, in camphor water, or in any suitable vehicle.

200. *C. Treatment of the third, or most intense*

* No. 312. ℞ Phosphori, gr. j ad ij; solve in æther. sulphur. ʒiij; olei terebinth. ʒij, et adde olei olivæ, ʒij ss.: pulv. gum. acaciæ, ʒj; aquæ menth. pip. ℥iv; olei cajuputi, ♏ xii; syrupi singiberis, ℥j. Misce secundum artem. Capiat cochlearia ij larga omni bihorio.

* No. 313. ℞ Aloës socot. ʒiv vel ʒv; gum. myrrhæ, gum. mastiches, benzoini, āā ʒij; rad. calumbæ concis., rad. gentianæ, āā ʒij; croci stigmat. ʒj; spirit. vini Gal. ℔ ix; spirit. vini Hollandiæ, ℔ iij. Macera per mensem, exprime et cola. This excellent tincture furnishes an illustration of the principle, first clearly explained and inculcated by HOFFMANN, that purgatives, particularly aloës, have their purgative action greatly increased by being combined with bitters and tonics.

grade of the malady.—In this grade the depression of the energies of the frame is as profound as is consistent with the continuance of life. The means of cure, therefore, ought to be most promptly administered, and energetically devised. The objects proposed to accomplish them are in every respect the same as were stated when treating of the stage of depression, in the slighter grade of the disease (§ 177.); but still more energetic agents are requisite to attain them than have yet been recommended, and most frequently even the most active we can devise are entirely unequal to the accomplishment of the ends we wish to attain. Indeed, the vitality of the several organs is so extremely depressed as to be incapable of being influenced by any moderate agent; the structures are far advanced to the state presented by them immediately after death; and the blood is no longer capable of being circulated. Treatment is therefore entered upon with feelings of despair; still, as recovery from this state does occur in rare instances, it is our duty to employ rational means to attain this end as long as life continues.

201. In this grade of the malady the stimulating *emetics* already recommended (§ 177.), with the view of exciting full vomiting, which the powers of the constitution are of themselves incapable of effecting, should be employed early, if at all, with the intention of inducing reaction; using at the same time stimulating frictions, the turpentine fomentation to the whole abdomen, as hot as it can be made; the hot-air bath, and the internal stimulants already prescribed (§ 195.), or some of those about to be noticed (§ 203.).

202. Bloodletting is advised by some writers, as early as possible in this grade of the malady, and denounced by others. My own experience and that of many practitioners in this country are decidedly against its adoption.

203. When the means already noticed fail, or seem inadequate to arrest the violence of attack, others which have sometimes succeeded in similar states of morbid action, particularly when they cannot prove detrimental, should be prescribed. I would, therefore, recommend a bolus, consisting of from ten to fifteen grains of camphor, an equal number of grains of calomel, two grains of cayenne, one grain of opium, and ten drops of any essential oil, as of mint, cajuput, &c., to be given with a sufficient quantity of conserve of roses. This may be administered after full vomiting, if it can be quickly procured, but without any regard to its continuance. If this bolus be retained, another may be given, and repeated in from one to two, three, or four hours, according to the urgency of the attack; but if rejected, it should be immediately repeated, until it at last remains. Not more than three or four of those boluses ought to be given, and frequently two will be sufficient.

204. Simultaneously with the administration of the above, thirst should be quenched by a frequent recourse to whey, to seltzer water or soda water with milk, by spruce beer, or by other diluents; and dry heat may be employed, and the turpentine fomentation applied, as hot as possible, to the abdomen and chest; and friction of the spine and thighs with any of the liniments prescribed above (§ 187.), made warm by plunging the vessel containing it in hot water, resorted to. From one to three hours after the exhibition of the bolus, a draught, consisting of from two drachms to half an ounce each of spirits of turpentine and castor oil, or of olive oil, with a few drops of the above essential oils, and forty grains of magnesia, should be taken in mint water; and if it be rejected, another should be given, and repeated, if again rejected, in half an hour afterwards; if retained, not until from six to twelve hours, when another may be taken. I have seen cases where the most urgent vomiting existed, and yet the above remedies (although both the bolus and the draught were taken at the same time) allayed, instead of aggravating, this symptom. Besides, it is our object to obtain full vomiting at first; therefore this cannot be viewed as an unfavourable operation of the medicine, if it should follow the exhibition of the first doses of it. In order to promote the influence of these means, a lavement, consisting of ten to twenty grains of camphor, or a drachm of assafœtida, half an ounce to an ounce and a half of the spirits of turpentine, and an equal quantity of olive oil, in a suitable vehicle, should be administered, and repeated according to the circumstances of the case. Much will depend upon the succession in which these remedies are given, the periods which are allowed to elapse between their exhibition, and on the doses and the decision with which they are prescribed. The hot turpentine fomentation, assisted by hot air and frictions with stimulating substances, is the most powerful means I am acquainted with of procuring reaction, restoring the heat of the body, and relieving the viscera from congestion.

205. The internal remedies now recommended, as well as the external means so frequently insisted upon, have been employed by me in many hundred instances of malignant and extremely dangerous diseases, and I have found them the most efficient of all others with which I am acquainted, when judiciously combined and administered, in rousing the energies of life, restoring the secretions, removing the congestion of internal organs, and in subduing that unhealthy sub-inflammatory state of action, which often occurs in fevers, and in diseases proceeding from infection and animal poisons, and which generally advances rapidly to fatal disorganisation. In aid of the above remedies, and particularly when the energies of the constitution seem to react, although most imperfectly, *effervescent draughts* with the sesqui-carbonate of ammonia, and the pyroligneous acetous acid in mint or cinnamon water, or in an infusion of cloves, the ammonia being in excess, may be given from time to time, and a *large blister* applied over the epigastrium upon the removal of the turpentine epithems.

206. I would also recommend, both in this most severe grade of the malady, and that next it in degree, the administration of medicinal substances in the state of vapour, and medicated gases through the channel of the respiratory organs. It has already been shown, that it is through these organs that the specific cause of the disease invades the frame, and that they suffer in a most remarkable manner from its impression, having their functions altogether paralysed, and their substance remarkably congested at a more advanced stage. If this view be entertained, the means of individual prevention, which are hereafter recommended, will appear the more deserving of adoption, and the directing of medicinal agents to this

quarter will, at least, not be considered unreasonable or undeserving a fair trial. Perhaps the inhalation of the nitrous oxide gas, or common air with a slight addition of oxygen, will be the most energetic remedies that can be employed in this way. Other means, also, which will readily suggest themselves to the well-informed physician, may be used; and amongst others the vapour arising from gently heating a strong solution of camphor in aromatic vinegar, or the vapour of the aromatic preparations of ammonia may be mentioned; and shocks of galvanic electricity may be passed through the chest.

207. Besides the use of frictions with hot cloths, or dry substances, or with liniments, which will not occasion cold by their evaporation—means which have already been advised—the application of hot air, or of hot salt, or bran, or hot oats around the body have all been recommended. In cases where the hot turpentine fomentation, or common sinapisms, have no effect; or in this most intense grade of the malady, without waiting for the effects of less active means, the subjoined cataplasm* may be applied over the abdomen. A trial may also be given to medicated vapour-baths; to baths, with the fumes of some of the volatile essential oils extricated by heat; and to dry-cupping in the course of the spine, with the view of removing congestion within the spinal canal, as well as of the kidneys and other parts. It may be remarked, that, in the most severe attacks, or when far advanced before medical aid is procured, scarcely any means, however well and energetically devised and practised, will prevent a fatal result; whilst the less severe visitations will generally be removed by any of the remedies enumerated, when judiciously combined and employed. There is reason to suppose that the slightest grade of the malady will even, by means of the vomiting and tumult excited in the frame, operate its own cure; and hence the reputation acquired by various mild or inefficient medicines and methods of treatment. There are few diseases, perhaps, which, while they preserve a perfect identity of character, present a greater range in grade than this; excepting, indeed, those maladies which propagate themselves in a similar manner to it. Indeed, it is chiefly to the mildness of the attack that we are to attribute the imputed success of such remedies as successive draughts of warm milk, olive oil, the Glauber salts, common salt, and various other mild preparations. In the more intense visitations, where the depression of the vital energies of the frame, and the vitiation of the blood are extreme, remedial agents should possess a co-ordinate degree of activity, in order to produce any effect whatever on the system.

208. If the above energetic means be judiciously put in practice, and brought to act simultaneously on different parts of the body, or prescribed in due succession and states of combination, as the scientific, zealous, and experienced practitioner may consider appropriate to the grade and stage of the malady, signs of reaction will sometimes manifest themselves; and then—particularly if it have not previously been employed, or when the state and circumstances of the patient furnish no reason against it,—a small blood-letting, either general or local, may be cautiously resorted to. If the stage of reaction be brought about, however imperfectly, the same intentions of cure, and the same measures to fulfil them, which I have already described when treating of the various manifestations of this stage in the less intense grades of the malady, should be appropriately employed against each of them respectively, as they may supervene in this most severe form of the pestilence, although success from the most active and judicious measures can seldom be expected in this stage of the malady, more especially if the urine still continues suppressed, or means to supply the lost serum of the blood be still unavailing.

209. As the exhaustion of strength is extreme, and as every muscular effort increases it, and as fatal syncope may soon occur in the most severe grades, from being raised to the erect, or even the sitting posture, means ought to be adopted to preclude the necessity of the patient's removal from the recumbent position for the purposes of evacuation. The discharges should be received in a bed-pan; and when medicines are exhibited, his head and shoulders should be raised no higher than is requisite to the accomplishment of the object. Mr. SEARLE very justly remarks, that attention to this injunction cannot be too strictly enforced, and states, that two patients under his own observation lost their lives from neglecting it.

210. It not unfrequently happens, that the active stimulants which we prescribed in the stage of depression, particularly in the more intense grades of the malady, together with the natural tendency of the disease, occasion inflammation, or a sub-inflammatory state of the stomach and bowels. When this occurs, the epigastrium and abdomen become extremely tender, and even tumid. Great irritability of the stomach is also present, and is increased after the ingestion of stimulating substances. In cases of this kind, venesection, the application of leeches, followed by the hot fomentation or the cataplasm prescribed above (§§ 179. 207.), and, upon their removal, by a large blister; the exhibition of calomel combined with small doses of camphor and opium; purgative or aperient injections, often repeated, and sinapisms or stimulating liniments to the lower extremities, are amongst the chief remedies.

211. In the treatment of this as well as of the following stage, all means will prove inefficacious as long as the *urine* is either suppressed or secreted in very small quantity. The defect of this excretion proceeds rather from the want of serum in the blood, than from a paralysed or congested state of the kidneys; therefore the beverages already advised (§§ 195. 198.) should be freely administered, and be made the vehicle of medicines in order to supply the loss, and dry-cupping followed by stimulating embrocations applied to the loins.

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* No. 314. ℞ Pulv. sinapeos, ℥ss; pulv. capsici annui; pulv. zingiberis, ãã ʒj; acidi acetici pyroligneï q. s. ut fiat cataplasma, dein adde olei terebinthinæ, ʒij. Misce.

The following compound tincture of camphor and opium seems well suited to the worst grades of this malady, in doses of one or two drachms, given in any suitable vehicle.

No. 315. ℞ Opii pulveris. ʒiij; camphoræ, ʒvj; corticis cinnamomi contusi; crocei stigmat. ʒij; caryophyllorum; pulv. capsici, ʒjss.; potassæ sub-carbon. ʒij; olei anisi, ʒj; spirit. vini tenuior. (vel sp. vin. Gallicus, vel sp. vin. Hollandicus), ℔j. Macera leni cum calore, per dies viij ad xii; dein exprime et cola.

212. *D. Treatment in the last stage, or that of exhaustion and collapse.* — In those cases in which efforts at reaction, or consecutive excitement, are manifested, exhaustion often rapidly supervenes, owing to the depressed and weak powers of life, to the morbid state of the circulating fluid, and the deficiency of serum. Hence the necessity, during the imperfect manifestation of excitement or reaction, to support the powers of life, even while we have recourse to small general or local depletions, to allow a free use of whey, or other diluents containing saline substances, as seltzer and soda water, and to act upon the secretions by means of purgatives given by the mouth, and in the form of injections: hence the propriety of removing the local determinations and congestions with which the attempts at reaction are more or less accompanied, by means of external derivatives and counter-irritants, employing tonics at the same time that we endeavour to restore the suspended secretion, and thereby to purify the blood, and to derive it from the seats of congestion. It is obvious, however, that these ends cannot be attained whilst the physical condition of the blood is such as not to admit of secretion or even of due circulation — whilst the blood is deprived of one half of its due quantity of serum. Therefore, due care should be taken to administer, by the mouth, and by injections, suitable diluents, and to persist in the exhibition of them, especially of those already mentioned (§§ 195. 198.), in hopes that a portion of them will be carried into the circulation, and supply the deficiency of the watery portion of the blood.

213. As all attempts at reaction must necessarily soon lapse into profound exhaustion, when made during inordinate depression of the powers of life, and a morbid state of the blood, characterised, not merely by loss of the serum, but also by an accumulation of urea, carbon, and other effæte materials requiring removal by the several emunctories, so the objects entertained should be to supply a due quantity of fluid to the circulating mass, and to conjoin with, or dissolve in, that fluid, such substances as will most powerfully and readily excite the action of the excreting viscera, particularly the kidneys and liver, and thereby remove the impurities accumulated in the blood. We ought therefore to resort to these means as early as possible, and in such modes and combinations as are best calculated to attain these objects. If, however, exhaustion proceeds rapidly, stimulants and permanent tonics, given internally; antispasmodic and tonic injections; hot air, hot cataplasms and fomentations; and the other internal (§§ 195. 207.) and external stimulants, described when treating of extreme depression occurring early in the disease (§§ 201—203), may be resorted to. Yet the vital depression will never be removed, whilst the urine is suppressed or scanty, without administering diluents as advised above (§ 204.), and saline purgatives and aperient enemata. It is in this state of the disease that the warm tonic and purgative medicines prescribed above (§ 199.) prove most serviceable, and that the patient requires to have his energies kept up by light nourishment, by grateful diluents and beverages, with a moderate quantity of wine, which latter may also be administered occasionally with injections.

214. In the more extreme cases of this stage of the disease, oil of cloves, or of mace, or of rosemary, or of British juniper, of rue, or lavender, to be applied warm, over the abdomen or epigastric region, and allowed to remain there, or to be renewed, according to the effect produced. In the more urgent cases, a cloth moistened with the warm oil may be placed in this situation, and kept closely applied by means of a compress, which will tend to prevent its rapid dissipation. In milder cases the oil may be combined with camphor and some one of the plasters in common use, as the galbanum, the pitch, or ammoniacal plaster, and these applied and renewed from time to time. I have seen, in cases of extreme vital exhaustion, with depression of the animal warmth, from other causes, the skin of a recently killed animal, particularly that of a sheep, wrapt round the body of the patient, the wool outwards, and advantage derived from the application. Even this or similar means may be tried as a last resort.*

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* I have adverted, in another part of this work, to the influence of the animal warmth of young healthy persons on those who are debilitated, or are labouring under extreme exhaustion. Since that was written, I chanced to find this mode of treatment strongly insisted upon by SYDENHAM (*Observat. Med.* l. 4. § 40.), and as follows, in the "*Medical Notes and Observations*" of SYDENHAM, just now published for the first time by Dr. GREENHILL, of Oxford, the learned editor of his works: —

"*De Methodo medendi Morbos per Accubitum Innioris. Cap.* 16. May ye 19th 1662 I was called in ye night to Mrs Change, whom I found very ill of a Cholera Morbus; she had many ugly Symptoms, as coldness of the Extreme parts, talking a little idly, intollerable Sickness, & felt a tingling in her Fingers & flesh outwardly. I judge it dangerous to use Dilutients especially by Clysters in a Women [*sic*] soe green (she having not lain in a Month) & ye Disease pressing soe hard upon my heels; Soe I orderd her to take a warm Cordial, & that a good draught of it, & her Husband to lie close to her Back naked, and her sonn of 12 years close to her Belly, & to lay on more Cloths & to warm her Leggs & Hands wth hot Cloths: She immediately fell into a moderate Breathing, & all Sympt. ceased: & after enjoyning her to keep her bed ye next day, & to eat & drink nothing save a small Quantity of Barly-broth a day for 2 days she perfectly recoverd.

"February 1661 I was called to Mrs Hulston, who after a very Chronical fever was fall'n into a very fatallike Diarrhea; I saw it was to noe purpose to give astringents seeing ye Disease proceeded from a Decay of natural heat, therefore I took this Course, viz. I caused her Sonn a plump hot Lad of 13 years of age, & her Nurses sonn of 6 or 7 years to goe to bed to her naked, & to lie ye one close to her Belly, ye other close to her Back, wch they did, & as long as they continued wth her she had noe stools: but ye Boys rising at any time ye Looseness would immediately return. I commanded that she should persist in ye Course till her cure should be compleat, (the Boys relieving one another by turns in ye daytime) & soe she fully recoverd not only of her Looseness but also of her Sickness in generall.

"The very same course I took with one Mr Little, who had a fever abt 7 weeks, & at yt time Aug. 1662, soe far spent yt his Drs judged him a Dead-Man: He was ancient & having been much purged wth violent Medicaments, he was as weak as ever I saw any yt recoverd; I (having to noe purpose made attempts to lay his fever by inward Medicines & to raise his strength by Cordials) told his wife that nothing could preserve his life but ye putting a Boy to bed to him: soe she procured a Link boy to lie very close to him all night, & ye next morning I found his fever allmost off, & his Eye & Countenance more lively, upon wch I pronounced all danger to be over, yett afterwards upon my giving him a Clyster & upon ye recess of ye Boy he began to relapse; but ye Boy being gott again & I giving noe more Clysters he perfectly recoverd.

"The very same way had I cured before Bp. Monk's Lady, who was an aged Woman of a very feeble & thin habit of Body, & had an Ague wch (tho gone) had soe weakend her yt her Physician Dr. Ridgley looked upon her as dead; when I was sent for she had also spitten some purulent matter & blood wch they shewed me (in abundance) upon ye Napkin. I told ye Dr yt I apprehended yt nothing could save her life, but a speedy transplantation of some young Spirits upon her, to wch he

215. *D. During convalescence* from this disease, care should be taken to prevent relapses. It is very frequently observed, that at the commencement of convalescence, the patient is tormented with an uncommon craving for food. This should be restrained, and but little, or at most a moderate quantity only, and of a light, digestible kind, allowed to be taken. The severe nature of the attack, the derangement of the digestive mucous surface, and the disturbance accompanying it of all the digestive organs, must necessarily leave them for a time incapable of discharging their functions in a regular or active manner. They should therefore have no more imposed upon them than they seem capable of performing.

216. It frequently happens that, owing to neglect of this precaution, and occasionally to too early exposure to the vicissitudes of season or of weather, or to cold, chills, or wet, after an attack of this malady, a relapse occurs and carries off the patient. Care, therefore, should be taken to protect the surface of the body, and particularly the extremities, from cold during convalescence, to regulate the diet and regimen of the patient, and to promote the return of the healthy action of the stomach, bowels, kidneys, and other secreting viscera. In order to accomplish this last object, gentle tonics will be necessary; and as the functions of the bowels generally require aid, this should be afforded by combining aperients with tonics, and by gradually increasing the quantity and nutritious quality of the food,

No. 316. ℞ Pilulæ hydrarg. ℈j; Pilulæ aloës cum myrrha ʒss.; Saponis Castil. gr. x. Fiant pilulæ xii, quarum capiat binas alternis noctibus.

No. 317. ℞ Quininæ sulph. ℈j; Pilulæ aloës cum myrrha; Extr. gentianæ, āā ʒss.; Pulv. capsici ℈j; Olei caryoph. q. s. Fiat massa æqualis et divide in pilulas xxx, quarum capiat binas omni meridie; vel

No. 318. ℞ Infusi gentianæ co.; infusi sennæ comp. āā ℥iij; potassæ sub-carb. ʒj; tinct. cardam. co. ʒss. m. Fiat mist. cujus capiat cochlearia iij vel iv ampla, hora somni vel primo mane.

217. After the frame has been fortified to a certain extent by these means, and the functions of the bowels and the secretions are brought to a healthy state, the shower-bath, or the salt-water bath, may be employed, in order to bring about a complete restoration of the energies of the constitution. Whichever of the two kinds of bathing be adopted, active friction of the surface of the body should follow upon coming out of the bath, and moderate exercise be taken in the open air, either on foot or on horseback.

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readily agreed, & a Girl of 13 years was put in close to her Breast, upon this she recovered very speedily both of her Unspiritedness & her Coughing: But ye Girl fell sick, wch was attributed to her lying wth ye Lady, tho I was confident to y° Contrary, having never known any Mischief yt way; however she had first coming out upon her Petechiæ, & afterwards large Ulcers upon her Breech; But Dr Ridgley & I recoverd her."

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PESTILENCE — HÆMAGASTRIC. —

SYNON.; — *Pestilentia hæmagastrica* (from αἷμα, *blood*, and γαστὴρ *the belly*), Author. — *Typhus icterodes*, Sauvages, Cullen. — *Febris flava*, Auct. Var.: — *Synochus icterodes*, Young; — *Causus*, Moseley; — *Febris flava Americanorum*, I. Frank; — *Epanetus malignus flavus*, Good; — *Fièvre Jaune, Typhus Jaune, Fièvre Mattelotte, Mal de Siam*, Fr. — *Gelbes Fieber, Schwartes erbrechen, Westindisches fieber*, Germ. — *Febbre gialla*, Ital. — *Fiebre Amarilla, Vomito nigro, Vomito prieto*, Span. — *Hæmagastric Fever*, or *Pestilence*, Author; — *Yellow Fever, Black Vomit, Malignant Yellow Fever, Pestilential* or *Bulam Fever, Epidemic Yellow Fever.*

1. DEFIN. — *After chills, shivering, and languor, severe pain in the orbits and forehead, also in the loins and limbs; rapid pulse, flushed face; glassy, suffused eyes; peculiar burning heat of skin, and frequently delirium; nausea and vomiting, with epigastric pain, costiveness, great anxiety, restlessness, and watchfulness; subsequently hiccough, black vomiting, scanty or suppressed urine, hæmorrhages from the mucous canals, lemon or muddy yellowness of skin, generally terminating in death in its most severe form.*

2. PATHOLOGICAL CHARACTERS. — *An infectious miasm or animal poison, specifically affecting the organic nervous and vascular systems and the vitality of the structures; impairing the crasis and constitution of the blood and the vital cohesion of the tissues; and more especially implicating the stomach and digestive mucous surface, and leaving the frame protected from a second attack, if recovery take place.*

3. The origin, nature, and treatment of this pestilence have attracted the attention of the medical profession, and even of governments, in a remarkable manner for many years. The ravages of it, during 1793 and 1794, in the West Indies and the United States, and the subsequent recurrences of these ravages both in America and in Spain, have furnished most important subjects for investigation, and have engaged the abilities of several eminent physicians, both in this and in foreign countries. Notwithstanding the volumes of descriptions and of controversy which have resulted, opinions are still unsettled respecting the source and true nature of the disease. It may be reasonably inquired, what are the causes which have so long retarded our knowledge of so important a subject? These, it may be presumed, are in many respects the same as those which usually stand in the way of our advancement in every other department of human science. The subject presents also difficulties which are peculiar to itself; and not a few sources of error are attributable to many of the writers who have attempted to furnish information respecting it, or to enter the lists of controversy. There are, perhaps, but few of the numerous disputants on either side of the question, who can at the present day be quoted as authorities, deserving in every respect implicit confidence. The majority of them entered upon the inquiry — if indeed due inquiry or research were ever attempted — with judgments previously biassed. Others possessed neither that amount of scientific education, nor that tutored state of intellect, which are requisite to medical observation in all circumstances, and particularly in those connected with investigations into pestilential visitations. Where it was most necessary that the relations subsisting between the geological formations, the soil, the locality, the climate, and the meteorological vicissitudes of a country, and the states of the brute as well as the human inhabitants, should be comprehensively yet accurately observed, in respect of their healthy condition, of prevailing diseases, and of epidemic visitations, many of the elements

requisite to the formation of sound views have either been overlooked or purposely exaggerated or even misrepresented: some have drawn sweeping conclusions from narrow fields of observation; and many have erred, more or less, in considering this pestilence in too close connection with those maladies which have existed previously or appeared subsequently to its prevalence. The importance of ascertaining differences, as well as of marking points of similarity, upon which specific differences, or identity of nature, may be based, has been overlooked; and much too frequently a few features of similarity have been seized, and identity of character has been thence assumed, without duly estimating the numerous differences associating themselves with each of these features. It must not, however, be forgotten, that occasionally there appeared in the arena individuals, whose opinions will always obtain respect, and who added to their scientific and medical reputation by the discussion, and who evinced, by an honourable spirit and temperate zeal, that truth was the sole object of their inquiries.

4. In thus regretting that the visitations of this pestilential fever,—which I have above denominated, from its prominent pathological characters, Hæmagastric Pestilence or Fever,—have not always been observed, during their rise, progress, and decline, by persons altogether qualified for the undertaking; and that the subject has been viewed as seldom from the "elevated table land of human science," as with minds entirely divested of prejudice or preconceived opinions; it must also be admitted, that the amount of scientific acquirement actually brought to the task of investigation has often tended more to entangle than to elicit the truth. The little that is known, or rather our want of knowledge, of the nature of malaria, of the constituents of emanations from the soil, and of other imputed sources of pestilential diseases,—the mist of ignorance and of prejudice involving these agents and exaggerating their influence—their inferred operation, without further proof of their existence than certain effects which have been imputed to them, either upon insufficient data, or even without the smallest evidence—combined to mislead those who generally repose on the authority of others, and to prevent those salutary measures of prevention being undertaken, which can be based only upon sound views of the source and nature of pestilence. The undue weight of insufficient or false authority, the array of imperfectly observed phenomena and "false facts," and the prevalence of hastily preconceived opinions, of false theory, and of premature generalisation, have swayed the minds of many from obvious truths and natural conclusions, into errors of the most deplorable kind, and plunged not merely towns and districts, but populous cities and kingdoms, into the deepest abyss of misery. Concentrated marsh or terrestrial exhalations, according to many of those who most plumed themselves on their science and philosophy, produced plague in Egypt and other parts of the Mediterranean coasts, gave origin to yellow fever in the West Indies, the United States, and in Spain, and was the only cause of pestilential cholera over the globe. The influence of this cause, and its power to produce all these and many other effects, were as firmly believed in by them and with less, certainly with no greater reason, than TERTULLIAN believed in the power of the devil to produce similar distempers: "Inducere potest morbos et sanitates. Viscerum actiones potest inhibere latenter, et venenis nobis ignotis corpus inficere." And what have been the results? The history of pestilential yellow fever on both sides of the Atlantic during little more than half a century is the reply—a history the more humiliating to medical science, and to human nature, the more intimately it is investigated. Whether a belief in the influence of terrestrial exhalations, as presumed by the pseudo-lights of medical knowledge, or confidence in the power so dreaded by TERTULLIAN and some other fathers of the church, actuated those whom circumstances unworthily and most unhappily clothed with authority on many important occasions, is not material as respects the results; for, as either belief must necessarily have led to similar consequences, and as neither agency could be controlled by available means of prevention or counteraction, so they were left to their own course, and thus gave rise to effects of the most deplorable kind. If the simple truth had been seen and the dictates of common sense been followed, measures calculated to prevent the extension of pestilence at its earliest appearance would have been taken, and successfully carried out on many occasions; but unhappily truth and common sense are as seldom the basis of theory, as they are the incentives of human actions. The simple fact that certain distempers were communicated from one person to several, from a few to many, might have been viewed as sufficiently intelligible, and considered as sufficient grounds for a disregard of all opposing views which had no other basis than vague hypothesis, certainly none stronger than that confided in by TERTULLIAN, and have led to attempts at isolating the affected, and thereby protecting the healthy. But, before proceeding to the discussion of the topics to which this train of ideas would lead, and which will more appropriately be considered in the sequel, I must *first describe* the pestilence now under consideration.

5. I. DESCRIPTION.—*Hæmagastric or continued yellow fever* resembles scarlet fever in some respects, and more especially in the several degrees of malignity and the modifications it presents, in different individuals, during the same epidemic. Generally the higher the grade of atmospheric temperature in which it occurs, the more stagnant the air, the closer the situations and the apartments, the greater has been the prevalence and the mortality of the pestilence. It manifests, also, a greater predilection for some constitutions than for others, attacking some in a very mild, and others in a very malignant form. Sir W. PYM states that this peculiarity was very remarkable at Gibraltar in 1804, where, in some instances, whole families fell victims to it, while others, equally numerous, under the same treatment, escaped with a slight attack. The same was remarked at Seville, Cadiz, and other places, and in other epidemics. The states of constitution and temperament giving rise to this predilection are not so manifest as to permit any thing being stated with precision respecting them. Owing, however, to temperament, sex, age, and constitution, in some measure, and to other *predisposing* and *concurring causes* hereafter to be

mentioned; this distemper presents certain *grades* or *modifications*.

6. i. The *mildest form* of hæmagastric pestilence is most frequently observed in children; and, during some epidemics, in females, although occasionally, females have suffered most severely. It generally makes its appearance with languor and slight chills, soon followed by heat of skin; quick and full pulse; uneasiness in the loins and limbs; severe headache, confined chiefly to the orbits and forehead; a peculiar shining or drunken appearance of the eyes; hot dry skin; a loaded but moist tongue, with little thirst; sickness at stomach, with costiveness, and a feeling of uneasiness, not amounting to pain, at the epigastrium, and a sense of rawness or soreness in the fauces and in the course of the œsophagus. These symptoms may continue from twelve to twenty-four or thirty-six hours, when the patient, having taken only some purgative and febrifuge medicines, or an emetic, falls into a refreshing sleep, from which he awakes in a gentle perspiration, free from pain and fever, and complaining only of debility, from which he rapidly recovers.

7. ii. The *more severe* and more frequent form appears more suddenly, and the symptoms are much more violent. The attack is ushered in by shivering and rigors. The pain in the orbits and forehead is excruciating; severe pain is also complained of in the loins and calves of the legs; the face is flushed; the eyes are glassy, suffused, or apparently inflamed; the pulse is rapid; the skin burning hot and dry; and the tongue is loaded, but moist, with little thirst. A few hours afterwards, uneasiness of stomach, with nausea and vomiting, supervenes; followed by severe pain and tenderness at the epigastrium, with a sense of rawness, heat, or inflammation in the fauces and down the œsophagus; great anxiety, restlessness, and watching, with a desire of sleep. The bowels are constipated, the evacuations scanty and deficient in bile: the urine dark-coloured and small in quantity.

8. If the disease be judiciously treated, these symptoms often become ameliorated on the second or third day; the patient falling into a sleep, from which he awakes refreshed, with a perspiring or moist skin, and nearly free from all the symptoms. Debility only remains, the recovery from which is generally rapid. In many cases, however, either a partial amelioration only occurs, or the more complete subsidence of the symptoms is of short duration; the patient in a few hours beginning to be troubled with flatus in the stomach, and distressing hiccough. Not unfrequently the patient is suddenly and unexpectedly seized with faintness, sickness, and painful retchings, followed by vomiting, at first of whatever had been taken into the stomach, but soon afterwards of a brownish fluid, resembling dirty water, mixed with a dark-coloured flaky matter, which floats upon its surface; and at last, by a matter resembling coffee grounds or thin pitch. At this time, also, a great change takes place in the countenance, which assumes a putrid, dingy, and bloated appearance, which is most remarkable in those of a florid or sanguine complexion. A light yellow or lemon tinge appears under the eyes and ears, and soon spreads down the neck to the chest, and over the whole body. The vessels of the conjunctiva appear relaxed, and distended with blood. The vomitings continue, and the quantity of fluid ejected much exceeds that which has been drunk. They often return without being excited by ingesta; or even suddenly or unexpectedly, and when the patient has just before considered himself relieved from them. In the latter hours of the disease, they are attended by a peculiar loud and hollow noise, which is heard at a considerable distance. During this state, the patient is generally sensible to surrounding objects, and aware of his fate. He is restless, continually tossing about in his bed, with an expression of despondency in his countenance. He looks anxiously and inquiringly around for relief, but unable to express all his misery and his wants. At last, worn out with restlessness and fatigue, he sinks without a struggle.

9. iii. The *third form* of attack also commences with shivering or rigors, and is an aggravation of the symptoms of the second from the beginning. In this form, the face is more flushed, and the burning heat of skin is greater than in the preceding. The sickness at stomach, hiccough, and black-vomiting appear much earlier. The bowels are obstinately constipated, and resist strong purgatives; the motions being watery, of a dirty colour, and rarely feculent or bilious. Violent delirium often occurs early in the attack, and hæmorrhages frequently take place at an early period from the nose, mouth, eyes, ears, and even from all the outlets of mucous canals. The tongue is often clean, moist, livid, or red, and raw-like, or covered with dissolved blood. The action of the kidneys is suppressed, either little or no urine being secreted. The countenance changes to a livid and yellowish hue, with yellowness of the skin. In the most severe of these attacks the patients may be carried off on the second, but generally on the third day, sometimes in convulsions.

10. In plethoric persons and in the sanguine temperament, the attack is often most violent; and in addition to the symptoms just mentioned, the countenance appears bloated and heavy, with an unnatural expression, or wild and agitated. The heat of the surface, which was at first great and pungent, falls first in the extremities, and afterwards over the whole body, especially after the occurrence of black vomiting; and ultimately it sinks below the natural standard. The skin becomes compacted, losing its vascularity, and is insensible to the irritation of blisters. It is rarely dotted with petechiæ, but much oftener streaked with yellowish lines, particularly in the course of large blood-vessels, or is covered by patches of a bluish or leaden colour, especially in flaccid parts. The sense of internal distress increases as the febrile action subsides. Distension of the hypochondria, and explosions of flatus from the stomach, are frequent, with occasional obscure hiccuppings. Sometimes the vomitings are hardly complained of until the more febrile symptoms begin to abate, when they become unrestrainable: the matters ejected are then muddy or turbid, like unstrained coffee; occasionally they are of inky blackness, like the juice of the cuttle-fish. The evacuations by stool sometimes also present a black appearance at this stage. In the more severe states, the disease frequently terminates fatally within the fifth day. In the less severe cases, signs of an imperfect crisis sometimes ap-

pear about the seventh day; and improve to favourable indications; but occasionally they are arrested in their course, and superseded by an unfavourable train of symptoms, as hæmorrhages from the throat, gums, mouth, and sometimes from other outlets of mucous canals. The blood is dissolved, dark, incoagulable or grumous, particularly at a far advanced period of the disease.

11. iv. The *fourth form* of the pestilence seems a modification of the symptoms by temperament and habit of body, although the precise conditions of these cannot always be assignod, the phlegmatic, apparently, most frequently exhibiting it. In this, the symptoms are not so violent as in the third form, but they are equally fatal. It often commences insidiously, the patient complaining, for hours, or even longer, of nothing but languor or fatigue, which is followed by chilliness or rigor, with pains in the loins and calves of the legs. The headache is not very severe. The pulse is quick and small. The heat of skin is very little increased; but there are great anxiety and oppression at the præcordia, and an indifference to surrounding objects. The bowels are obstinately confined, and the secretion of urine is arrested. The tongue is often unnaturally clean, and of a clear shining vermilion colour. Hæmorrhage appears early from the nose, gums, or mouth, and is sometimes attended by petechiæ and vibices. There is little or no thirst, but great irritability of stomach, with hiccough and black vomiting, attended sometimes, as the distemper proceeds, especially towards the fatal close, by an involuntary discharge of the same appearance from the bowels. The peculiar change of countenance, with yellow skin, takes place as in the other states, and is frequently accompanied with a low muttering delirium. The temperature of the surface generally falls below the natural standard as the disease advances. Distress at stomach and intolerance of pressure over this region are generally present. The bowels are almost insensible to the action of purgatives, which either produce no effect, or only watery evacuations — sometimes cold, ropy, and black, as if mixed with powdered charcoal. As the distemper advances, the pulse sinks in frequency, becoming weak and small. In some instances it sinks below the natural frequentcy, and becomes irregular or intermittent. Death in this, as well as in the preceding state, may occur as early as the second day, especially when the brain is the prominent seat of morbid action; but it more frequently occurs on the third or fourth day, or not until the fifth, sixth, or seventh. A favourable change is remarked chiefly on the third, fifth, or seventh day.

12. v. The above are the chief states of the distemper commonly observed, modified, however, or the one passing into the other, according as constitution, concentration of the cause, and varying concurring circumstances aggravate the seizure. Certain anomalies may, however, occur; but modifications in the type are not observed. They are, however, noticed by some writers, and others, as Dr. JACKSON, have described a form in which the symptoms are at first remittent, but become continued in the course of the malady. When treating of the more severe states of remittent fevers, especially as they occur within the tropics, and beyond the tropics in localities and seasons favouring the development of the more intense or malignant forms of remittent fever, I have shown, that the passage of that type into the continued, is extremely frequent, especially when vital organs become more and more implicated, and when the disease increases in prevalence, so as to assume an epidemic character, the fever, with this change of type, generally also presenting in the worst cases the chief features of the true hæmagastric pestilence, particularly yellow skin, and in rare cases even black grumous vomiting. (See art. FEVER, REMITTENT, § 233, *et seq.*) These facts are admitted by the non-infectionists, and are indisputable. But it is not proved, that, with this change of type, and with the superventiion of these features, the fever, which certainly was non-infectious as long as it was remittent, becomes infectious as soon as it becomes continued, unless a number of affected persons are so circumstanced, especially from crowding and imperfect ventilation, during very warm and humid states of the air, as to contaminate the surrounding atmosphere; and thereby either to superadd the additional cause of a morbid effluvium exhaled from the sick to existing marsh miasmata, or to generate a morbid poison or vapour, which is of itself capable, independently of marshy or other miasmata, of infecting the healthy, and of disseminating the distemper. It is almost impossible on some occasions, and certainly difficult in all, to ascertain, beyond the reach of controversy, whether the one contingency or the other obtains: still the observing physician will generally arrive at just conclusions on the subject, and act in such a manner as the great responsibilities reposed on him will justify.

13. That a superadded property, or at least a change of character, should result from the circumstances just alluded to, may be rationally inferred; for the aggravation of symptoms and the development of new features, in these altered circumstances, have frequently been observed, are undoubted, and are the chief sources of much of the differences of opinion and of the discussions which have appeared since the end of the last century on the subject of yellow fever; for, owing to them, and to causes sufficiently noticed above (§ 12.), these aggravated states of remittent fever, either passing into, or originally assuming more or less of a continued form, have been confounded with the true or infectious yellow fever — with the pestilence now under consideration. The circumstances, moreover, of the latter being developed only during those high ranges of temperature, and in those situations which render remittents thus malignant and prevalent, has increased the difficulty of distinguishing the one from the other, and has led several writers, who have observed the simultaneous prevalence of both maladies in the same locality — a circumstance by no means infrequent in the West Indies, and in some other countries — to describe both as varieties merely of one distemper, and to ascribe the properties possessed only by the one to the other also. As much ambiguity has arisen from this source, I will notice, more particularly than can be done when treating of the *diagnosis* of this pestilence, certain symptoms which require attention, as well as others which are only occasionally remarked. Such diversities or modifications of character evidently result from diversity of the predisposing and concurring causes, from the con-

centration of the infectious agent, or the dose of the animal poison conveyed in the atmosphere, and from the idiosyncrasy or constitution of the infected.

14. *Suddenness of attack* is one of the prominent characters of the malady; there seldom appearing any premonitory ailment, at least of such severity as to attract particular notice. In some cases, however, a feeling of fatigue or lassitude, with headach and costiveness, are complained of for a short time previously. *The pains* felt in the head, loins, limbs, and often also in the large joints, generally precede or accompany the chills, shiverings or rigors attending the seizure; and these are often very severe, but they appear to change their character, without being less distressing, as reaction takes place. *The seizure* usually occurs in the night or morning, but there are numerous exceptions to this period. The *pulse* during the cold or incipient stage varies. It is small, frequent, and irregular, during the incipient state of chillness or rigor, during which the temperature of the skin over the trunk is generally increased, although it is much lower in the extremities. The pulse becomes more frequent, sometimes very quick, as reaction is developed, but it is also broad, open, soft, or very compressible. As collapse supervenes, it is soft, weak, or irregular, ultimately becoming small, feeble, or suppressed. The pulse, however, in this stage of exhaustion varies much in different cases, owing to the loss of a considerable portion of the serum and hæmatosine of the blood by vomiting, and according to the amount of such loss, as well as to the impaired irritability of the heart. The *tongue* varies in its character as the disease advances, and often also at the commencement, as well at the close of the distemper, it presents different appearances in different cases. It is frequently at first furred or loaded in the middle or root, but moist and red or inflamed at the point and edges. It is in some moist, red, purplish, and clean; in others it presents a dry streak in the middle, and in many, and those the most unfavourable, it is of a vermilion-red or purplish-red colour, covered in a few instances with an exudation of fluid blood, either at an early, or at an advanced stage, according to the violence and danger of the attack. It often has a raw appearance, and is more or less swollen or flabby.

15. The *countenance* varies in appearance and expression with the progress of the distemper, and the age, habit of body, and temperament of the patient. At the commencement of the seizure, the face is usually pale, and the features somewhat sunk; but, as soon as the chills and rigors cease it becomes full, flushed, and turgid; the lips tumid and red; and the eyes protruded, prominent, bright, and inflamed, with exquisite pain at the bottom of the orbits, and in the forehead. As the disease advances, the countenance assumes a peculiar *pale lemon colour*, which, in the most unfavourable cases passes into a *livid, muddy, or putrid appearance*, which has been aptly likened by Sir W. PYM to that presented by the face in the childish diversion of snap-dragon. In thin, emaciated, and aged persons, the features become sunk, especially as the disease advances; but in others, unless when the quantity of dark fluid thrown off the stomach is very great, the face continues tumid to the last, particularly when the fatal progress of the malady is rapid. A sense of constriction is often felt in the *chest*, and anxiety at the præcordia; and towards the close there is a continued movement of the hand over the præcordia and chest. The *breathing* is often laboured, occasionally deep or suspirious, with a peculiar groaning or moaning; and the voice is frequently altered. A burning heat is usually felt at the epigastrium, and not infrequently in the course of the œsophagus. Every thing is rejected from the stomach, and the patient tosses his head and limbs about. *Stools* are always procured with great difficulty early in the distemper, and whilst reaction continues; but, after the deceitful calm, about to be noticed (§ 17.), they often become more free, and sometimes involuntary. They are always scanty at first, offensive, watery, and deficient in bile; but they frequently are black and watery, sometimes with small lighter-coloured flocculi in the last stage, and when black vomit has taken place. The *urine* is at first scanty and high-coloured; and in the worst cases it is entirely suppressed, none being secreted, owing either to a paralysed state of the kidneys, or to the quantity of serum lost by the blood, as in the pestilential cholera, by the frequent and copious discharges from the stomach. The patient generally feels severe pain in glans penis and urethra when the urine is suppressed, or passed only in a few drops. The *blood* is always more or less changed—most remarkably after the calm occurring on the third day. Even at the commencement and during reaction, it does not coagulate, or does so imperfectly and loosely, and is deficient in fibrine. It afterwards becomes still more loose and defective as to crasis, and ultimately very dark, partially dissolved, and grumous; and apparently insufficient in quantity, in many cases, to distend the veins. The *perspiration* and the *evacuations* are very offensive, and have a peculiar sickly odour, which thoroughly imbues woollen and cotton clothes, and the patient's bedding.

16. The *mental manifestations* are variously affected in different persons. In some, violent delirium occurs; in others, low delirium, occasional wanderings of the mind, or waking dreams, are remarked; in many, the mind is not materially affected throughout, unless inasmuch as the patient may be despondent, taciturn, depressed, or apathetic. An early conviction of a fatal issue, indifference to the result, and a calm apathetic resignation to his fate, are frequently observed without any further mental disturbance, the patient's intellects continuing unimpaired to the last. In some, the violent delirium present during an early period disappears, and the mind afterwards remains calm until death.

17. Slight *exacerbations* are sometimes remarked in the evening, and ameliorations in the morning; but these are rarely so considerable as to amount to remissions, the disease generally pursuing a continued course until the third or early in the fourth day, when a deceitful *calm* appears. The pulse then often falls to nearly its natural frequency, sometimes even below it; the eyes lose their brilliancy. The heat of skin also sinks, especially in the extremities, when it often falls below the natural standard. This calm usually continues all the fourth day, and the patient, feeling some returning craving for food, thinks himself

convalescent; but lemon-yellowish of the skin, sometimes delirium, mental depression or apathy, faintness upon being raised up, or upon being placed on the night-stool, vomitings, and hiccough often appear about the following evening or night; sinking of the pulse and temperature, especially in the extremities, black vomiting, suppression of urine and other fatal symptoms supervening more or less rapidly. In many cases the heat of surface sinks remarkably, and the extremities assume a livid appearance, the pulse being hardly felt in the limbs.

18. In the above description of this malady I have followed my own observation and recollection, aided by notes taken during my attendance upon cases which came before me within the tropics. Some of these cases occurred in a vessel in which I was a passenger; and in circumstances which strongly favoured a belief in an infectious source, as will hereafter be alluded to. The numerous descriptions of the disease which I have perused, vary somewhat, especially in certain subordinate particulars, most probably owing to the varying features of the distemper in several epidemics, and in different climates, localities, and constitutions. The chief difference, however, consists in the severity of attack, and the intensity of affection evinced by the blood and digestive organs. The most dangerous cases are not those in which the symptoms are most violent, in respect of vascular or nervous excitement; but those in which the vital powers are most depressed, the blood most changed, and the black vomit most early, copious, and frequent. (See §§ 9—11.) The differences between these and the slightest grade (§ 6.) are very great; the degree of fatality of the disease in America, West Indies, Spain, or Africa, depending upon circumstances about to be mentioned.

19. vi. Several of the writers on this distemper have divided it into certain *stages or periods*. These stages are often well marked; but, in many cases, they are hardly manifest. In the most violent seizures, the patient is suddenly struck, and the distemper proceeds rapidly without reaction, or nervous or vascular excitement, to vital and structural dissolution, with every indication of extreme vital depression, of vascular contamination, and of impaired or nearly lost irritability and cohesion of the tissues. When either the powers of the constitution are sufficient to resist the overwhelming influence of the pestilential poison, or the dose of this poison is weak relatively to the state of vital resistance, then vascular reaction takes place, with or without nervous excitement, and a division of the progress of the malady into stages or periods, according to the successive changes in the states of morbid action, may be made with justice. But writers are not agreed as to the precise division which should be adopted. Some recognise merely two stages, viz. that of *excitement*, and that of *collapse* or *exhaustion*. Others contend, and with much justice, that the stage of *invasion*, or that period which is characterised by chills, rigors, or an alternation of chills and heats, and which in a few cases is preceded by a sense of mal-aise, fatigue, and headache, for a shorter or longer period, should be viewed as a distinct period. I am of this opinion, and am confirmed in it from having had an opportunity of almost constantly observing, in several cases, the phenomena during this stage, and its frequent passage into the next, or that of excitement or reaction. Other authors have considered the delusive calm ushering in the period of vital exhaustion as a distinct stage; but it rather indicates the passage of reaction into collapse, the subsequent severity of the symptoms being merely the efforts made by the vital resistance of the constitution in endeavouring to overcome the morbid changes which oppress and ultimately overwhelm it.

20. It has just been remarked, that, when the infectious agent is very powerful relatively to the constitutional powers of the patient, the attack may then be so violent, and its subsequent course so malignant, as to deprive the vital energy of all power of reaction. In this case the invasion is sudden and severe, and is attended by general tremor, dread, terror, or despondency; the vital depression of this period passing into vital and even structural dissolution, with greater or less rapidity, and either with no attempts at reaction, or with weak and abortive efforts merely; the symptoms of the first period insensibly passing into those of the third. In those cases, which are much the most numerous—in which reaction or excitement occurs, and which are generally met with in the young, robust, plethoric, and in persons whose health has been previously good, the following division of the periods of the distemper, with their chief characters, may be made.

21. FIRST PERIOD—*or that of invasion: Charact.*—Chills, rigors, or shivering, or alternation of chills and heats; headache, with pains in the loins and limbs; fear and timidity; universal trembling; tremor of the tongue when held out, and inexpressible terror in the most severe or fatal attacks.

22. SECOND PERIOD—*or that of vascular reaction and excitement.—Charact.*—Very frequent, full, broad, or bounding, but soft or very compressible pulse; a loaded and pasty tongue, with redness at the edges and point; caustic heat of surface; rending or throbbing headache, with red, suffused, protruding, and brilliant eyes; pain at the epigastrium and anxiety at the præcordia; racking pains in the loins and limbs; tossings and watchfulness; general redness, turgidity, and suffusion of the face; sometimes delirium; vomitings and thirst, obstinate costiveness, and scanty pale stools.

23. THIRD PERIOD—*or that of vital exhaustion.—Charact.*—Often an amelioration of the above symptoms during the third or fourth day, followed by an increased frequency of vomiting; a lemon hue of the skin, with dirty, lurid, or livid patches as this stage advances, the matters ejected becoming in some instances black; distressing singultus; low or muttering delirium, or resignation or apathy to the result, or a desire of dissolution; quick, small, feeble pulse, which is sometimes at last irregular, intermitting, or slow; raw, red, livid, moist, or dry, and clean tongue; faintness, especially on moving; loss of temperature in the surface and extremities; irregular, laborious, deep, and moaning respiration, the expired air being raw and colder than natural; scanty or suppressed secretion of urine; small, black, watery, and involuntary stools; exudations of blood from the mouth, nostrils, anus, vagina, &c.; a peculiar offensive odour from the body and evacuations; the appearance of large livid or

discoloured patches, terminating in dissolution, with marked putridity, the body exhaling a tainted odour.

24. vii. The *duration* of these stages is various. The *first* is seldom longer than a few hours; but it may be hardly of an hour's duration, or so slight as not to attract particular attention. The *second* stage varies from two to three days—it is seldom longer, and it may be even shorter than the time named. It may be, as above noticed (§ 20.), altogether wanting, or imperfectly manifested. The duration of the *third* is still more indeterminate. It may be only a few hours, or it may be two or three days or even somewhat longer, it altogether depending upon the violence of the attack and the powers of the constitution. In slight or favourable cases, this stage may not be remarked, or merely a few of the milder symptoms may only be noticed. In the most severe or fatal cases, this stage follows closely upon the first, and is attended by most of the malignant symptoms just enumerated, as early as the second or third day; and in some epidemics by others, but occasionally only. The *whole duration* of the malady varies from three to eight or nine days, but in rare instances it has been protracted to ten or twelve days.

25. viii. The *sequelæ* ascribed to the distemper by some writers deserve notice, only to observe that I do not believe in their existence. The debility consequent upon the attack cannot be justly viewed as belonging to this category, more especially as convalescence is generally rapid and complete. The visceral congestions, obstructions, and enlargements mentioned as sequelæ of yellow fever by several authors rarely or never occur after the true hæmagastric distemper, although they are frequent after severe forms of remittent fever (see FEVER, §§ 237. *et seq.*), attended by yellowness of skin. They have been mentioned in connection with hæmagastric pestilence owing to the circumstance of it, and the worst cases of the seasoning fever of hot climates, and of remittent fever, having been confounded with each other by these writers. This circumstance also explains much of the imputed frequency of *relapse* in this pestilence; for the debility attending convalescence or recovery from it, renders the patient predisposed to be affected by the miasmata causing remittent fever; and hence, when hæmagastric fever prevails, as it usually does, in situations where remittent fever is endemic, and in seasons when it is most prevalent and malignant, recovery from the former malady is extremely likely to be followed by an attack of the latter; and, more than this, the one disease is very liable to be mistaken for the other.

26. II. APPEARANCES AFTER DEATH. These vary remarkably with the form and character of the malady.—*A. In the most malignant* and rapidly fatal cases, a lemon tint of the surface, with livid or dark blotches, is generally observed. The ears, fingers, penis, scrotum, and in some the hands and arms soon become of a dark or brownish hue. The *muscles* are softer and flabbier than natural, of a dirty or dusky hue, and are easily broken down by pressure. The substance of the *heart* is similarly changed. Softening or greater friability of the tissues soon after death is generally remarked, and is extended to all the organs and viscera. The *body* seldom appears to suffer any diminution of its bulk, as in other fevers; and when the fatal issue has been rapid, and the quantity of black matter vomited not very great, the several viscera are more or less congested, and the body seems even more tumid than natural, as well as discoloured; presenting a marked putrid or malignant aspect, and indicating a remarkably rapid loss of the vital cohesion of the several textures. In such cases as present any diminution of the bulk of the body, the muscles are paler, softer, and more flabby than usual; the viscera paler and softer, and even somewhat shrunk; and the bloodvessels contain very little blood. In these cases, a very large portion of the blood has been exuded from the digestive mucous surface, and been thrown off during life, in the form of black vomit, or of passive hæmorrhages from the alimentary and other canals.

27. The *liver* is changed chiefly as regards its cohesion and degree of congestion. It is almost always softer and more friable than natural; in some cases congested, in others pale, according to the quantity of blood evacuated during life, in the form of black vomit. Light olive-coloured patches are sometimes observed in it. The *gall-bladder* most frequently is shrunk, and contains little or no bile. The *spleen* and even the *pancreas* are somewhat softened; and the former frequently congested. The *œsophagus* and *stomach* present discoloured streaks or patches, of a dirty purple, dark, or livid colour, in their mucous surface, and the latter viscus often contains more or less of a similar fluid to that constituting the black vomit. In cases where the quantity of this fluid thrown off has been great, the stomach, intestines, and other viscera are paler, but also much softer than natural. The *small* and large *intestines* are often contracted in parts, and occasionally introsuscepted. In other respects they offer the same appearances as noticed in the stomach, but in a less degree. They often contain small quantities of fluid similar to that voided shortly before death; but this presents neither a bilious nor a fæcal character. The *epithelium* of the digestive mucous surface seems to be more or less detached in the several portions of the canal; and the mucous membrane is softened and readily separated from the adjoining tissue. The *follicular glands* are not prominently affected, further than being somewhat enlarged in some instances. In those cases which present congestion of the chief organs, as of the brain, lungs, auricles of the heart, liver and kidneys, slight serous effusion, sometimes sero-sanguineous, is occasionally also found in the *chief cavities*, particularly the pericardium and arachnoid, and but rarely in the peritoneal and pleural cavities. The *urinary bladder* is always empty and contracted.

28. *B. The more protracted cases of this pestilence* present changes depending much upon the symptoms during life, and most upon the continuance or amount of black vomit, and of black fluid discharged by stool. In many instances the appearances found agree in all respects with those above described. In others, the *liver* and *spleen* are remarkably congested and softened. In some, the liver is changed more or less in colour as well as softened. It is often of a pale olive hue, or it presents a mixture of yellow and green, and of dark green in streaks. AREJULA mentions a change of colour in the liver to a reddish brown.

But the other changes detected furnish no evidence of inflammatory action in this organ. Dr. GILLKREST notices a remarkably pale colour of the liver in females and children, and a marked absence of bile from the biliary ducts. The *gall-bladder*, however, frequently contains bile of a thick consistence and dark tar-like appearance. The *stomach* often contains the matter of the black vomit. Its mucous surface, as well as that of the *duodenum* and *œsophagus*, is frequently discoloured in patches, in a few instances paler than usual, and in all much softened. The epithelium of these parts is generally detached; and Dr. JACKSON remarks, that he has found the villous coat often abraded, loose, and partially separated. A black jelly-like substance is sometimes found in the *intestines*. Dr. GILLKREST states, that this substance is sometimes found in the jejunum, but oftener in the ileum, and that it is occasionally found in both the stomach and the ileum, the intervening jejunum not presenting a trace of it. He adds, that he has found this substance in these situations even in cases where no black vomit had existed before death. The glands of PEYER are generally unaffected. The villous surface of the *colon* and *cæcum* is generally softened, discoloured in parts, and covered by an adhesive black substance. Frequently on removing this substance the membrane underneath is seen paler than natural. In a few cases, the fluid contained in the bowels is of a reddish tint, and more nearly approaches the appearance of blood. The intestinal canal is often irregularly contracted in parts, more rarely with portions introsuscepted, and in some instances, in addition to the matters now mentioned, an albuminous dirty pale substance is found in the colon.

29. The states of the *heart* and *lungs* depend chiefly upon the quantity of blood exuded during the last stage in the form of dark vomit. When very much has been evacuated, but little change of these organs is observed beyond collapse and softening. In other cases more or less congestion is frequent, the blood being fluid, grumous, but not always very dark. False polypi are sometimes found in the cavities of the heart. Within the *cranium*, congestion is the most common change, but this is not constant. Occasionally slight opacity of the arachnoid, with slight serous effusion, and in rare instances, sero-sanguineous exudation, are remarked.

30. These are the chief alterations found in cases of true hæmagastric pestilence, when the examination has been made a few hours after death; but further changes take place, and are often confounded with the foregoing when the inspection has been delayed even some hours later. The disease is rarely observed, excepting in such high ranges of temperature as preclude delay in *post-mortem* examinations, if the changes which appertain to the disease are the objects of investigation. Doubtless, however, the circumstance of rapid dissolution of the structures after death, and the ascertainment of the parts which are the first to experience such rapid change, are matters of great moment in estimating correctly the nature of the malady; and so highly do I consider their importance, that I am desirous to direct more attention to them than they have hitherto received.

31. III. DIAGNOSIS.—From the description now given, it will be perceived that sporadic, occasional, or scattered cases of this distemper, and the earliest of those occurring when it assumes the form of a devastating pestilence, will often be recognised with great difficulty, and be liable to be mistaken for the more malignant cases of *remittent fever* (see Art. FEVER, §§ 233. *et seq.*); or even for the *inflammatory seasoning fever* (§§ 359. *et seq.*) to which Europeans are subject when they migrate to intertropical or warm climates. The difficulty is chiefly owing to the mildness of the symptoms in some instances, and to the circumstance of yellowness of the skin, and vomiting of a dark brown or black fluid being observed in many of those cases as well as in the true hæmagastric disease. The mild character of the symptoms in some persons, the disease appearing merely as an ephemeral fever, or in a form but little more severe, is analogous to what is observed in respect of other infectious maladies, which frequently assume a most malignant character, as small-pox, scarlet fever, &c.; nevertheless, the infectious effluvium proceeding from mild cases propagate the malady equally with that from the most virulent, and often give rise to the latter, whilst the latter frequently occasion cases of the former character; the violence of attack depending chiefly upon the predisposition of the individual affected.

32. There are certain phenomena which serve more especially to distinguish this pestilence from the malignant cases of fever with which it has frequently been confounded, and from which it is distinguished with great difficulty, especially in warm climates and localities, and in hot seasons. The former is more silent, insidious, yet rapid in its course; the latter more open and phlogistic. As soon as the body appears to be infected by the hæmagastric distemper, there are furnished indications of a greater or less shock sustained by its vitality, and of a marked contamination of the circulating fluids, and even of the soft solids; and these indications appear earlier and more decidedly in this distemper, than in the fevers for which it is liable to be mistaken. Jactitation, mental depression, apathy or delirium, appear much earlier, and in a more marked degree at the outset. The lemon-colour of the skin is also earlier; and such also is the case with the nausea and vomiting, which is more distressing than in those, and the quantity of fluid thrown off, at first and sometimes throughout colourless or nearly so, is much more considerable, without reference to what has been taken into the stomach. It is evident, that the fluid ejected is chiefly an exudation or secretion from the stomach, that its great amount must more or less diminish the serous portion of the blood; and that, in those cases which are attended by black vomit and discharges of blood from mucous canals, the dimunition of, and other changes in, the blood, must be still more considerable. In these more especially the vomitings often occur without retchings or effort.

33. The character of the pulse is of importance; and in respect of it, the rapid rise in frequency soon after the attack; the soft and asthenic condition; the weakness, inequality, irregularity, and subsequently the slowness, the intermissions and smallness of it, are more or less remarkable. The red, suffused, state of the conjunctiva, with brilliancy of the eyes in the young and robust, but without this brilliancy in the aged, and at an ad-

vanced stage; the lurid redness or suffusion of the features, in the former class of subjects, and the depressed and anxious expression in all; the severe pain, deep in the orbits, and the drunken-like appearance of the eyes; the red, raw, clean and smooth, or bloody state of the tongue; the pain and soreness of the throat, pharynx, and along the œsophagus; the acrid burning sensation at the stomach, constriction in the chest, and anxiety and burning pain at the præcordia; the thick, compacted feeling furnished by the skin, the diminution of its sensibility at an advanced stage, and the dingy tint of it, with leaden or livid patches, at last; the singultus; the scanty secretion, or complete suppression of urine; the costiveness, absence of bile from and state of the stools; and the flaccid, leucophlegmatic, swollen, and pallid appearance of the soft solids, without very evident emaciation in most instances, but with an appearance of morbid plumpness, or turgidity in the more malignant and rapidly fatal cases, serve further to distinguish the malady.

34. Vibices and livid patches are characteristic both of the pestilence itself, and of the advanced and fatal period of it; and depend upon the alteration that has taken place in the constitution of the blood, as well as in the vitality of the capillary vessels, both venous and arterial. The delirium is generally different from that observed in the worst forms of remittent fever. It is characterised by a peculiar imbecility, fatuity, and apathy, and by faultering of the voice, or stammering. Furious or violent delirium rarely occurs unless in the early stage of febrile excitement. The pupils of the eyes are usually dilated, especially during an advanced period of the malady, and frequently even at an early stage, when the conjunctiva and countenance are suffused and injected — a state of the pupils which is not observed in yellow remittent fever. The pains in the legs are also different from that complained of in other fevers; and are generally felt where the gastrocnemii and soleus muscles unite to form the tendo Achilles.

35. The yellowness of the skin, in the hæmagastric pestilence, is either a pale yellow or a dingy tint, often presenting patches of a dirty yellow or livid hue: in the *yellow remittent fever* the colour is more complete and deep than in the former, and more manifestly the result of biliary disturbance; whilst the discoloration of the pestilential malady arises from vital exhaustion, manifested chiefly in the capillaries and in the blood itself. M. GUYON very justly remarks that, in the latter, the colouring of the skin is owing to the presence of blood which stagnates in the capillaries, or which escapes from them, and is nothing else than the tinge of a contusion; whilst, in the remittent fever, the colour is owing to the presence of bile, and is that of true icterus. This alteration of the blood and of the vital condition of the capillaries is evidently the source of the black vomit, and of the dark colour of the evacuations, in the last stage. The singular spasmodic force with which the fluid is often ejected from the stomach; the presence of hiccup when the dark matter is less copiously thrown off; the peculiar dark stain which this matter imparts to linen, and which is not easily removed; the raw and unpleasant odour, which, as Dr. W. BARRY remarks, "is so peculiar, that, on entering the chamber, the state of affairs becomes immediately manifest," serve further to distinguish the malady. The early appearance of a dingy yellowness on the neck and chest, and the state of the patient's mind, even when there is no delirium, are also worth remarking. The sufferer is generally either unconscious, or quite indifferent to his hopeless condition, and expresses himself as being much better, until vitality, receding from the extremities and external surface, ceases altogether in the central organs. During the last flickerings of the expiring flame, there are often observed incoherent expressions, violent straining of the eye-balls, and convulsive motions, rapidly passing into dissolution.

36. About the end of the second day, or during the third day, the patient begins to complain of a violent pain in the testes, with contractions of the spermatic chord towards the abdominal ring. On examination, the testes feel much diminished in size, are drawn towards the abdomen, and the scrotum is flaccid and empty. The surface of the scrotum soon after becomes very painful, and an excoriation takes place on the surface, chiefly of the most depending part, from which much offensive puriform matter issues. At the same time a similar discharge often takes place from the urethra, which ceases as the symptoms become favourable, but which becomes bloody, ichorous, and insufferably fœtid, when dissolution ensues. The most violent attacks are generally attended, in the last stage, by an offensive and ichorous discharge from both the scrotum and the penis, these parts frequently becoming more or less sphacelated and gangrenous shortly before death.

37. *A.* Besides the *diagnosis* depending upon the presence of certain symptoms, characterising the hæmagastric pestilence, which are not observed in the worst forms of *remittent fever*, the origin and course of the former, compared with those of the latter, malady should not be overlooked. Malignant or bilious remittent fevers, even in their most intense grades, proceed entirely from malaria, or emanations from endemic sources of disease of a more or less concentrated kind (see ENDEMIC INFLUENCES), and present more or less marked *remissions*. In many of the situations furnishing these emanations, dead animal matter, as well as dead vegetable matter, aided by a deep, rich absorbent soil and great humidity, performs an important part. Still the resulting malady does not produce a specific effluvium, capable of itself to propagate a similar disease, at least in ordinary circumstances; and if ever such a phenomenon occurs, it can take place only under peculiar circumstances, which furnish a new and superadded cause, as shown above (§ 12, 13.), this cause giving rise to a very different malady from that which arose from endemic causes, however concentrated or intense.

38. On the other hand, the hæmagastric pestilence appears independently of endemic or terrestrial sources or malaria, and proceeds from an infectious or contagious poison, which, however formed *originally* (see hereafter, § 139, *et seq.*), infects the healthy by contaminating the air immediately surrounding those already affected; or which, being absorbed and retained by other bodies (as shown in the article INFECTION, § 16, 17.), is afterwards given out from them on exposure to the air, thereby contaminating and infecting the air and adjoining objects.

39. The *course* also of hæmagastric pestilence is generally different from that of yellow remittent fevers. The former malady is not only much more sudden in its seizure, but also more insidious, silent, *continued*, and rapid in its course, than the latter. The one, even in its most intense grades, as I have observed them in Africa, where they are most malignant, very rarely ending fatally before the 8th, 9th, or 10th day; the other generally terminating life before the first of those days, and frequently as early as the second day. Mr. FRASER, whose experience of this pestilence in Gibraltar was frequent and extensive, observes that a variety of very striking symptoms, rarely seen in the fevers of the country — such as tremors and nervous agitations; singultus; extraordinary mental aberrations; an unexampled range of hæmorrhages; affection of the urinary evacuation, vomiting becoming seemingly vicarious of urinary discharge; a peculiar odour perceptible on approaching the sick, this odour being presumed to occasion the infection of the healthy; quick and perfect recoveries from violent attacks, with little or no risk of relapse, or of consequent visceral diseases, — sufficiently distinguish this malady from all others. He further adds, that the seizure of this malady is characterised by peculiar dejection of countenance, pain in the orbits, often attended by a peculiar delirium, similar to the effects of narcotics, or of poison on the nervous system, causing algor, tremor, anxiety, sighing, singultus, and sudden death. The course of it, he says, resembles that of the exanthemata, viz. a synochal stage of sixty hours, suddenly terminating in apyrexia, or running into malignant or putrid symptoms, unattended by remissions, but with vespertinal exacerbations, and with a fallacious calm, similar to that which marks mortification, and closing generally, in fatal cases, before the seventh day; recovery protecting from a second attack. Whilst, on the contrary, *endemic* or *yellow remittent fever* is a disease of high arterial action (in the Mediterranean), with that turgescence of countenance which usually attends pneumonia, with a general sense of fulness in the encephalon, and throbbing of the temple, but with little delirium; is much more prolonged in its course, and accompanied with heat of surface, and often with bilious yellowness; sometimes terminates in intermittent fever, or in visceral disease; is very prone to relapse, and second attacks are common. (See art. FEVER, § 225, *et seq.*)

40. It is not only upon the characteristic symptoms, *continued type*, and course of this pestilence, compared with those of remittent fevers, that the diagnosis is to be based, but also upon the cause, origin, and propagation of it, — upon its infectious nature — *infectious* in the sense which I have attached to the term (see art. INFECTION, § 13, 16,), or contagious, without direct or immediate contact between affected and healthy persons; a property admitted not to exist in respect of remittent fevers, even of the worst forms. This subject, however, as it involves the most important considerations, and as having called forth the most virulent and ungenerous discussions, will receive a fuller consideration in its more appropriate place.

41. *B.* Hæmagastric pestilence differs from the *plague*, in being attended by more violent febrile excitement; in the absence of carbuncles and buboes, the lymphatic glands being enlarged only in the most intense and fatal cases, and in few instances only; and in the occurrence of the black vomit, which is very rarely observed in the latter pestilence. Undue importance has been attached to the circumstance of the former appearing during a high degree of temperature, which would put a stop to plague; for, although hæmagastric pestilence generally requires a high range of heat, still it will often continue to prevail, after it has become epidemic, during very temperate states of the atmosphere. Doubtless, however, the plague will continue to prevail during low ranges of temperature — ranges which will altogether arrest the progress of the hæmagastric pestilence.

42. *C.* The milder cases of this malady are distinguished with great difficulty from *common continued fever;* for some of these not infrequently assume the form of ephemeral fever, or of simple inflammatory fever; others, that of bilious or gastric fever; others, that of the seasoning or ardent fever of Europeans recently arrived in warm climates; some resemble adynamic fever, and others true typhus. The predominant affection of a particular organ; the more sthenically inflammatory character of all the symptoms, especially of the pulse; the more diffused pain in the head and forehead; the states of the eyes, of the evacuations, and of the skin, attending *inflammatory fever*, will readily distinguish it from this pestilence. When this fever occurs in Europeans lately arrived in a warm climate, or assumes a more intense form, or that of *seasoning fever*, the diagnosis may be much more difficult; especially when, as is not infrequently the case, much biliary derangement and gastric irritability are present. In these cases the conjunctiva and skin may become yellow; and blood may be exuded in some instances from the digestive mucous surface, and impart a black grumous character to matters ejected from the stomach, or evacuated from the bowels. Here the diagnosis is difficult, particularly when such cases occur only occasionally. Still, the close observation of even a few cases will enable the physician to recognise the character of the disease, which is always preceded by distinct præmonitory symptoms, is inflammatory at the commencement, and is attended by a free discharge of bile — phenomena which are not met with in this pestilence. Seasoning fever is, moreover, of longer duration than this malady; and in many localities, or during or subsequent to the rainy season, generally presents more or less, or lapses into, a remittent type, and is often followed by visceral disease — occurrences which are not met with in the hæmagastric malady.

43. *D.* Hæmagastric fever can hardly be confounded with *typhus* or *typhoid fevers*, for the prominent symptoms, the course and duration of each, are altogether different. Dr. BANCROFT, whose writings on this pestilence, and on the causes of pestilential diseases, have misled the inexperienced, and long mystified many, has stated the circumstances in which the former differs from the latter; but his statement (see p. 51. of his work) betrays a remarkable ignorance both of true yellow fever and of typhus. Indeed I doubt much his having seen a case of true hæmagastric fever when he published his Gulstonian Lectures, delivered at the College of Physicians in 1805, and which constitutes the substance of his work on

yellow fever; or, if he had seen any case of this pestilence, he must have confounded them with the more malignant cases of remittent fever, as his remarks on the diagnosis, and much of his description of the former, are much more applicable to the latter than to it: indeed, throughout his work he evidently confounds the hæmagastric malady with malignant remittent fever, and considers them identical diseases; for he no where attempts to distinguish between them; and he merely points out, in a manner the most imperfect, certain points of difference between yellow fever, plague, and typhus; but in a way altogether worthy of the Coryphæus of the non-infectionists.

44. The symptoms which have been above enumerated (§ 7, *et seq.*) solely appertains to this pestilence, and so certainly indicates it, that, should a patient present them in a country liable to be afflicted with it, or in an European sea-port, holding intercourse with parts in which it is epidemic, during warm or temperate seasons, we may be assured that a case of it has occurred; and this assurance should give rise to measures hereafter to be indicated. If the case be a solitary one, or if only a very few such occur — and if isolation and other early precautions be taken, this may be the result — the fact may be disputed in the special-pleading mode in which the subject has been recently discussed; and the more especially if the patients recover, or if no examination of the bodies of those who have died has been made; for in these the black vomit and several of the other pathognomonic symptoms may have been wanting. The circumstance of the disease, particularly when epidemic, frequently assuming a mild form, should not be overlooked; for amongst a certain number of cases at the outbreak of the pestilence, a small proportion may only present the black vomit, several of the rest appearing only as a simple ephemeral fever. As M. LOUIS has well observed, in respect of the Gibraltar epidemic of 1828, although some of the symptoms of other diseases are similar to those of yellow fever, the symptoms taken together, and their progress, are very different.

45. In *typhoid fevers* vomitings are rare, whilst in this malady they are very common, frequent, and urgent; and, in the worst cases, they are peculiar (§ 8.). Diarrhœa, more or less abundant, occurs in a large proportion of the cases of typhoid fever, and often also at the commencement of the disease; whilst an opposite condition of the bowels is observed in true yellow fever. The stools are also very different, both in colour and character, and are never so dark or blackish as in the latter malady. The form of the abdomen is natural in hæmagastric fever; there is usually more or less meteorismus in typhoid fevers. In true typhus there is a peculiar eruption on the surface of the body, a characteristic delirium, and other febrile symptoms, and extreme prostration, not observed in the other malady. Whilst typhus and typhoid fevers are slow in their course, the hæmagastric pestilence is rapid.

46. *E. Gastritis* may, in some circumstances, especially in warm climates, or when associated with hepatitis, be mistaken for hæmagastric fever. In both diseases there are more or less frequent vomitings, attended by burning epigastric pains, anxiety, &c.; but the duration of gastritis is generally longer than that of this fever, and the anxiety is less. The yellowness of the skin is absent, unless when gastritis is complicated with hepatitis or with disease of the biliary ducts; and when such is the case, the yellowness is a true jaundice, and not that of this pestilence. Besides, the intense pain of the orbits, the appearance of the eyes, the blackish stools, the suppression of urine, and, in fatal cases, the black vomit of this latter malady, are not present in the former.

47. *F.* In *hepatitis* there is yellowness of the surface, but with these are also more or less severe pains in the right hypochondrium, and an increase in the volume of the liver, as may be readily ascertained by examination of the trunk, and by percussion; no such increase taking place in this pestilence. Then the severe pain in the orbits and the injection of the eyes at the commencement, the anxiety and the several nervous symptoms, so constant in this latter, are not observed, whilst the course of it is so much more rapid than that of hepatitis.

48. *G.* In fatal cases, the *post mortem* examinations generally will decide the question as to the existence of the hæmagastric malady; for in them the presence of the peculiar black matter in the stomach or intestinal canal, or in both; the absence of material alteration of PEYER's or BRUNNER's glands; and the usually *yellow colour* of the liver, independently of other very manifest organic changes, are especially characteristic of this malady. M. LOUIS observes, "that if the liver be found of a more or less pale yellow, its cohesion and consistence natural or increased, all doubts as to the disease should be removed." But the consistence of the liver is not infrequently diminished, and the colour of the liver is rather that of rhubarb than a pale yellow, and is often such as described above (§27, 28.). The pale yellow colour of the liver, considered so diagnostic of this pestilence by M. LOUIS, was also insisted upon in the very excellent work of MM. FRANCOIS, BALLY, and PARISET on this malady, as they observed it in Barcelona in 1821; but, in the numerous dissections they made during that epidemic — one of the most prevalent and destructive on record — they particularly notice the rhubarb colour of this organ.

49. IV. PROGNOSIS. — It is only from a very close and attentive scrutiny of the several symptoms individually, and of their combination, as constituting the general state of the patient, that a correct opinion can be formed of the event in this malady. — *A.* The expression and appearance of the eyes, the general aspect of the countenance, the torpor of the system, the depression of the spirits, and the imbecile state of the mind, described under the last stage of the malady (§ 16.), afford the worst, and the reverse of these symptoms the most favourable, prognosis. Tremors of the hands and lips; restlessness; violent spasmodic contractions of the legs or arms; aphthæ, resembling curd, on the tongue or gums; dark spots or specks around the mouth or on the upper lip; hæmorrhages from the nostrils, mouth, anus, urethra or vagina, or from the eyes, ears, or pores of the skin, especially when the blood is dark, decomposed, or ichorous, or has an offensive odour, and the parts from which it proceeds have a raw or a sphacelated appearance; and sphacelation of the scrotum or penis, — are fatal symptoms.

50. Pain in the fauces and throat, descending

in the course of the œsophagus, with redness of the tongue and pharynx; a burning pain in the region of the heart, especially when attended by great agitation, or by an expression of despair in the countenance; a change of voice, from the usual manly sound, to a weak treble, or to a tone much weaker, softer, lower, and shriller than the natural one, the words being drawled out in a strange whining manner, particularly when this change of voice occurs early in the disease; very scanty, offensive, and discoloured urine, or its dark, greenish, blackish hue, or its suppression, or its passage in drops with severe pain above the pubis and in the urethra, with retraction of the penis; petechiæ, vibices, livid spots and patches on the surface; enlargement of the glands of the groins, armpits, and angles of the jaws; vomiting of black, grumous, or flaky fluids,— are, even when existing singly, most dangerous symptoms; but when several of them are present, they preclude hopes of recovery.

51. When the disease appears with early symptoms of malignancy;—when the pain in the head is intense, and confined chiefly to the lower part of the forehead, the orbits, and eye-balls; the conjunctiva being red, and the face deeply flushed; —when a violent or a melancholic or despondent delirium occurs early, or a fixed opinion that death will ensue is entertained;—when the pulse is full, very soft, and very rapid; or irregular, unequal, intermittent, or at least slower than natural, small, and weak;—when the skin is very harsh and hot at the commencement, and cold at an advanced period, the patient complaining of burning internal heat;—when the tongue is red, smooth, flabby, or covered by a sanguineous exudation;—when yellowness or a mottled state of the skin, patches of discoloration, and black vomit appear, and especially if either or all supervene early in the disease;—when exudations of uncoagulable blood take place from the mouth or other outlets of the body, or the quantity of black fluid thrown up is great;—when singultus is attended by extreme anguish and restlessness, or with muttering, moaning, or with a weak, sharp, or wild unnatural tone of voice;—when the urine is suppressed, or the evacuations are black, grumous, or watery;—when the extremities become livid, cold, or mottled, and the patient lies on his back;—then, whether these symptoms appear either singly or combined, recovery very rarely takes place; and never when the lips are cherry-red, and tumid; the eye ghastly, or glistening; the skin damp, flabby, torpid, and presenting streaks or patches of a livid, greenish, or violet colour, and when a nauseous odour issues from the body. Recovery is also never observed after violent hiccup occurring late in the distemper, especially if it be attended by discharges from the stomach without effort, or with loud flatulent eructations.

52. *B.* On the other hand, hopes of recovery may be entertained when the distemper is mild at its outset, or during the first three days; but, even in some such cases, the malady proceeds so insidiously as suddenly to present many of the most unfavourable symptoms on the fourth or fifth day, more especially yellowness of the skin, black vomit, suppression of urine, &c. The longer the stage of excitement continues, provided that the symptoms do not increase in severity, the event is more likely to be favourable; and this may be expected with more reason when an agreeable, warm, and general diaphoresis breaks out; when the irritability of the stomach ceases; when the eyes become more lively or natural, the discharges more healthy, and the urine more abundant. On the contrary, when the stage of excitement quickly or abruptly passes into the state of apyrexia preceding the stage of vital exhaustion, the worst form of this last stage, with delirium, coma, and the several signs of malignancy above enumerated (§ 23.), may be expected. If unfavourable symptoms do not appear before the fifth or sixth day, very reasonable hopes of recovery may be entertained. Mr. FRASER, whose experience of this pestilence has been most extensive, states that he "never had reason to be apprehensive of the issue after the sixth day, unless fatal symptoms had already set in."

53. If epistaxis occur early, or during the stage of excitement, and be moderate, and attended by amelioration of the cerebral or other symptoms;—if the pulse is neither very rapid, nor very weak, nor very soft, during the second day;—if the skin remain at an early stage soft, and without the caustic heat above mentioned;—if a miliary eruption break out;—if a quiet sleep take place, uninterrupted by vomiting;—if the patient lie on the side, and draws the clothes around him;—if the urine be voided in some quantity, and without pain in the urethra or glans;—if the evacuations become more copious, feculent, or bilious;—if the tongue, from being dry, turn to moist, hopes of recovery may be entertained; yet a guarded prognosis should nevertheless be given.

54. *C.* Dr. JAMES CLARK, one of the earliest and most experienced writers on this malady, observes, that if the yellowness appeared in 24 hours or 36 hours after the first attack; if the case had been left to nature, or the patient had been bled, and no powerful remedies attempted, recovery never took place. The sooner the febrile stage ended, he adds, when the case was left to nature, or only simple remedies were used, the greater the danger; and, on the contrary, the sooner the fever was subdued by powerful remedies, acting in an evident and decisive manner, the greater chance the patient had to recover. If the debility was not great after the febrile stage, and the yellowness did not appear before the fourth or fifth day, the sick generally recovered. Many also recovered after the yellowness, and even after bleeding at the nose; but, in all his practice, he recollected only four patients who recovered after black vomit had appeared (p. 18.). Of the cases which I had an opportunity of treating many years ago, one only recovered after this symptom had fully and unequivocally manifested itself. It should, however, be remarked, that vomiting of a dark grumous fluid, occurring with or after yellowness of the skin, not infrequently occurs in the last stage of malignant bilious or remittent fever (see FEVER, § 233, *et seq.*); and that recovery occasionally takes place in that fever, even after these symptoms have appeared. But the case is very different in the true hæmagastric pestilence. Most of the instances of recovery which we hear of from the black vomit, are recoveries from these states of yellow or remittent fever, which have been confounded with this pestilence.

55. Dr. CHISHOLM states that the critical pe-

riods or days are more distinctly marked in this malady than in any other observed in warm climates. The cessation of the disease, and the death of the patient, he remarks, always happened on the odd days; but the change in the state of the symptoms which preceded either event took place on the even days. Thus, if the patient was worse on the evening of the second day, he would die on the third; if worse on the fourth, he would die on the fifth; and so on as far as the fourteenth day. In the same manner, if the patient was better on the second, fourth, or sixth day, the resolution of the disease would happen on the following days.

56. *Pregnant females* always experience abortion, which is attended by excessive hæmorrhage, when attacked by this pestilence, and very seldom recover; and when women are seized by it during the first fortnight after delivery, recovery rarely or never takes place. Dr. JAMES CLARK states that, during the epidemic in Dominica of 1793 and 94, children, adults, and old people, labouring under small-pox, were generally attacked by this pestilence "about the time that the secondary fever usually comes on; and that none recovered but those who had begun to take bark and wine after the eruptive fever, and continued this remedy and a nourishing diet for some time after. It made no matter whether the small-pox were of the confluent or distinct benign kind. All fell victims to this disease who were not treated in the manner just mentioned."

57. V. MORTALITY. — But little can be stated respecting either the numbers attacked in a locality where this pestilence prevails, relatively to the amount of population, or the proportion of deaths to recoveries. It is obvious that, as regards the extent of diffusion of the distemper among the community, much will depend upon the means resorted to of guarding against it. As respects the epidemics which have occurred in Europe, and in some other places, the greatest fatality has been remarked among the early cases, or when the spread of the disease is reaching, or has reached, the utmost limit. Towards the decline of the epidemic, the proportion of recoveries increases; and this may be owing either to the less predisposition of the affected; to the depression of the temperature about the close of an epidemic; to the most susceptible, the most timid, and most exposed to the exciting and concurrent causes, having been the earliest attacked; or to the joint operation of these circumstances. Much, however, will depend upon the ventilation, cleanliness, and measures of prevention adopted; and more especially upon the avoiding of all those causes which tend to contaminate the surrounding atmosphere, and even of those articles which the foul air may imbue.

58. Dr. ROCHEAUX states that, at Barcelona, during the early part of the epidemic there, in 1821, the mortality amounted to 19 out of 20 attacked; but it diminished to much less; and at the close of the epidemic was two-thirds. Dr. KILLKREST remarks that, at Gibraltar, in 1828, very few recoveries occurred among the earlier cases in the Civil Hospital. "Of the first 35 Jews received into the establishment," but one recovered. The unusual rate of mortality among this people may partly be referred to their very general (constitutional?) despondency, when attacked by dangerous or epidemic maladies. In this epidemic at Gibraltar, one half the cases died in several of the military corps. It is stated by the physician just quoted, that, of the first 134 cases treated in Murcia in 1804, not more than three or four recovered.

59. The greater malignity, and consequently the greater fatality, of the cases, have been observed not only at the commencement, but also at a far advanced period, of some epidemics; as if the violence of the distemper had received a fresh impulse. Dr. TOWNSEND states this to have obtained in New York in 1822, the proportion of deaths to the affected being, as late as October, as three to four. On the other hand, a milder form of the malady has been more frequently observed in some epidemics and localities than in others. This circumstance may be partly attributed to the intensity and concurrence of those causes which predispose to, and determine or aid the more efficient and specific cause of the distemper, especially of a warm, confined, stagnant, and humid atmosphere; want of ventilation and of cleanliness; crowded sleeping apartments, &c. (§ 71.); dread of the disease; the season, temperature, and situation. Much, however, of the different degrees of malignity said to exist in different epidemics, and in different climates and places, may be imputed to the circumstance of the malignant states of remittent fevers on the one hand, and the inflammatory remittent and continued fever on the other, being often confounded, by some writers, with hæmagastric pestilence, when either of the former has become remarkably prevalent, and has been attended, as they sometimes are, by yellowness of the skin.

60. Some of the epidemics of yellow fever said to have occurred in the West India Islands, and in parts of the American continent, have been much milder than the visitations of this pestilence have been in Spain, during the early part of the present century. But it is by no means fully ascertained whether all the epidemics observed in the western hemisphere were actually the true yellow or hæmagastric fever, or merely an unusual prevalence of endemic or remittent fever, rendered more continued by intensity of attack, predisposition of the affected, and other circumstances. No doubt several of these epidemics were the pestilence under consideration. Their symptoms, remarkable prevalence, and fatality proved that some of them were this distemper; but others were of a different nature; and probably some of them resulted from the crowding of a number of human beings in a confined space, either in barracks, or in transports, or between the lower decks of ships of war, in a high range of temperature, and without sufficient renewal of the air. Numerous instances of malignant and even of pestilential fever of an infectious nature have occurred in this manner, and have been recorded by writers, and some of them have been noticed in the articles on EPIDEMICS.

61. Still the degree of mortality has varied much in most of the visitations of this pestilence which have been observed during the last half century, and must be attributed to the concurrence of several causes, especially to the predisposition of the attacked, the season and locality, to crowding of the population and of the sick, and to the amount of ventilation both before and after the seizure. The extent to which treatment may in-

fluence the proportion of deaths can hardly be estimated; and yet it doubtless, also, has very considerable effect. A recourse to "heroic remedies," in the language of some contemporary foreign writers, is certainly not attended with marked success; but much depends upon the nature of such remedies. For many years past medical practice was considered excellent in proportion to its activity, or, more justly speaking, to its violence; copious blood-lettings, large and frequent doses of calomel, &c., constituting sound and judicious, as it was no doubt active, practice in the eyes of the inexperienced.

62. All that can be said, as to the rate of mortality in various epidemics and visitations of this pestilence, as far as the data have been furnished, may be stated as follows:—1st. Where the infection has been introduced amongst the natives of temperate countries, either removed to a warm climate, or during a very warm season, and especially if the population thus predisposed be dense, or living in a close, crowded, and ill-ventilated locality, and if the air be very humid as well as very warm, and much more so if it be stagnant or imperfectly renewed, the distemper has been not only the more violent, more rapid in its progress and more fatal, but it also has been more rapidly spread. Thus the results have been most disastrous in towns where these circumstances have existed; and in ships of war and in transports, particularly after storms or states of weather which induced the closure of gun-ports and hatches, thereby preventing the renewal of the air, and favouring the development of concomitant causes. The spread of the distemper has been the more general or almost universal, and the proportion of fatal results has been the greater, the more the above circumstances have predominated, the more completely ventilation, segregation, and cleanliness were neglected, or imperfectly attained; and the greater the panic or dread of the distemper.

63. 2d. When the distemper has appeared in a population, of which a greater or less proportion has been formerly attacked, or has resided long in a warm climate, or consists of dark skined races, although such residence and race by no means confer immunity, as proved on many occasions;—also when it has appeared in more temperate countries, at a time when the cold season is fast approaching, and where due ventilation, segregation, and other due precautionary measures have been taken, and confidence has been secured, it is much more limited in its diffusion, milder in its character, and less fatal. Thus removal to a more open and elevated locality, the strict quarantine of the infected, free ventilation, a lower range of temperature, and a cooling regimen, have severally tended both to limit the extension of the malady, and to diminish the proportion of fatal cases; whilst opposite circumstances have invariably increased both the one and the other.

64. VI. CAUSES. — Although this distemper is owing to a certain specific cause — and the existence of this cause will be demonstrated in the sequel — still the infection of the previously healthy will be favoured by other causes, which either *predispose* the system to the invasion of the specific cause, or *determine* or aid the development of this cause, if the system have previously been exposed to it. Thus, the same influence may either *predispose* the frame to the reception of the infection, or *determine* the development of the malady, the infection having been received, but not manifested.

65. *A.* Of these causes or influences, which are rather *predisposing* than determining, the most important are age, sex, constitutional peculiarities, mental emotions, temperature, seasons, &c. The influence of these is apparent not merely in certain epidemics, but more or less in all, whether occurring within the tropics, or appearing in temperate countries. Certain of these predisposing and determining causes are *intrinsic*, or appertain to the individual; others are *extrinsic*, and implicate more or less whole communities.

66. *a. Age* has a considerable *predisposing* influence in this as well as in several other epidemic distempers. Adult age presents a greater degree of susceptibility to infection than either childhood or old age; and this is manifested both at the commencement and during the height of an epidemic. Towards the conclusion of very general and devastating epidemics, a larger proportion of children and aged persons is observed to be attacked than at an earlier period of the epidemic: but this is owing, as in the epidemic of Barcelona in 1821, to the circumstance of the increased proportion of these classes remaining unattacked, or liable to be infected towards the close of the epidemic; nearly all those of adult and middle ages having caught the distemper. The more rapid and general infection of adults, and those at the prime of life, is probably in part owing to their greater exposure to the existing cause of the distemper; nevertheless, more or less of increased susceptibility of infection appears to exist during these epochs of existence, than in any other. A similar circumstance obtains in other infectious fevers, and shows that the primary impression of the exciting cause is made upon the organic nervous system; for if this cause acted directly on the blood, the aged and debilitated, the susceptible the non-susceptible, the protected and the unprotected, would be equally liable to the contamination. Nevertheless, when the infectious effluvium is concentrated, or the exposure to it is more than usual, both children and old persons are attacked, and some infants at the breast do not escape.

67. *b. Sex.* — The frequency of seizure in the two sexes differs much in different epidemics, owing very probably to the varying degrees of exposure of each to the exciting cause. In the epidemic of Barcelona, females were as frequently infected as males, but a greater proportion of the former recovered. Much will necessarily depend upon the state of society in the place where the distemper prevails; but in most epidemics, a less prevalence, as well as less fatality, is remarked amongst females, as well as among children, than in adult males. This is probably owing in part to the state of the female constitution during the period of uterine activity.

68. *c. Constitution, habit of body, and race.* — It has been remarked in almost every epidemic that persons of a robust constitution, those of a rigid fibre, the plethoric, and sanguine temperament were the most frequently attacked, and had the disease in the severest form. However, when the pestilence became general in any locality, it has spared no constitution nor habit of body, excepting that which had previously been attacked. The greater immunity of the *negro race* has been often

remarked, but with insufficient precision. Individuals of this race have, however, not infrequently been attacked, both in the West Indies, Africa, and in America; but the distemper in them has assumed a milder character (§ 6.).

69. *d. The depressing passions*, more especially fear of the disease the loss of relations, anxiety, disappointment, &c., all tend remarkably to predispose the system to the operation of the exciting cause. Irregular modes of living; excesses of any description; prolonged abstinence; fatigue, of body or mind, and want of the requisite repose, exert a similar influence, although not so remarkably as the depressing emotions of the mind, and, with these, act both as predisposing and determining causes.

70. *e. Pre-existing disease*, and general feebleness of constitution, or debility in any form, certainly have no influence in predisposing to an attack, but rather prevent it. MM. BAILLY, FRANCOIS, and PARISET, state that this was very obvious in the epidemic of Barcelona; and that in their numerous inspections of bodies dead of the distemper, old visceral or pulmonary disease was very rare. They however remark, that syphilis did not protect from an attack; and that setons and issues appeared not to possess a prophylactic influence. They found that a few of the patients in the portion of the general hospital set apart for the insane were attacked, showing that insanity did not prevent the seizure of this pestilence. The chief of the *intrinsic* influences now mentioned, which seem to act also as determining causes, or which appear to aid the operation of the specific cause on the frame subsequently to exposure to this cause, are, the depressing emotions of the mind, excesses of any description, want of the natural repose, fatigue, and prolonged abstinence.

71. *B. Of the extrinsic influences or agents*, which tend not merely to predispose the system to the action of the specific cause of hæmagastric pestilence, but also to aid in developing the effects of this cause, *warm, humid, and stagnant states of the atmosphere* are the most remarkable. This pestilence has generally prevailed during high ranges of temperature, and at that season, and in those localities, in which considerable humidity was associated with warmth; and these with a still or calm state of the air, or with crowded habitations and imperfect ventilation. Such has more particularly been the case when this distemper has become epidemic in countries without the tropics. Within the tropics, all sheltered situations near the level of the sea, or near the sea-coast, present at all seasons the conditions, in respect of warmth or of humidity, requisite to the epidemic prevalence of the malady. Still, although these conditions are required for the development and dissemination of the infection, they are not either individually or conjointly capable of producing the distemper, without the operation of the specific exciting cause. They are merely the atmospheric conditions required to give the infectious germ activity.

72. The *seasons* which are characterised by a high range of temperature, and much humidity, as summer and autumn, are those in which this pestilence has become prevalent in temperate climates, when the infection has been imported or conveyed thither. A low range of temperature, and dryness of the air — although attended by much heat, have been found, on the other hand, to check the propagation of the distemper, and even to prevent its development. When the infectious seminium has been introduced in a crowded locality during degrees of atmospheric warmth and humidity favourable to the evolution and propagation of its effects, and when the consequent epidemic has become very general, the distemper often continues to rage, although the temperature of the season has fallen much below that observed during its outbreak; or even below that which is believed requisite to its development. This has been remarked in respect of epidemic visitations of the pestilence both in Spain and in the United States. That unusually high ranges of temperature have no influence alone in producing the malady, may be inferred from the facts observed in connection with the prevalence of it, both in hot and in temperate climates; for the periods of its appearance in the one, and the seasons of its occurrence in the other, have not been always, or even generally, characterised by unusual warmth. Indeed, a careful perusal of facts connected with the outbreak of the distemper in Africa, the West Indies, in Spain, and in America, fully convinces me that excessive warmth is not concerned in its production, more than a somewhat lower grade; a high degree of heat, as I have just stated, being only one of the conditions requisite to its prevalence, but then the presence of the efficient agent — the infectious seminium — is indispensable: this is the seed; warmth and humidity are merely the conditions of the soil requisite to its germination; and although the former may lie dormant for a time until the latter give it activity, still it is not less the efficient, the specific, and the undoubted cause of the pestilence.

73. *C. Infection.*—According to the definition I have given of this term in the article INFECTION, there can be no doubt in the mind of the unprejudiced, after a due examination of the evidence respecting it, as to the dissemination of this pestilence by infection. My limits will not permit me to detail, circumstantially, or even fully, all the facts which have been adduced by most respectable authorities, proving the propagation of this malady by infectious emanations proceeding from the affected, but I shall adduce sufficient evidence to show, that the true hæmagastric pestilence spreads in this manner, and that the evidence of its infectious nature is similar to that by which the infectious nature of scarlet fever or small-pox is proved and admitted. But small-pox, scarlet fever, and some other infectious diseases are amongst the most common maladies in our climate, and can no longer be prevented by measures in any way tending to embarrass traffic and mercantile speculation, whilst this pestilence, plague, and pestilential cholera, are foreign to this and most European countries, and the only modes of preventing their extension to these countries hitherto attempted, have been such as more or less hamper commercial undertakings at certain seasons and with some foreign parts. It cannot be denied by any one who has attended to the subject of quarantine, especially as it has been agitated in recent times, and with a due knowledge of the influence which the ruling passion—the desire of amassing wealth — exerts upon all the more generous and social emotions of the mind, that the restrictions imposed upon trade, arising out of precautions

against the introduction of pestilential infections, have been the chief causes, directly or indirectly producing the opposition to the doctrine of the infectious properties of pestilences; and that all that has been written to disprove this doctrine — and written with no small virulence by some — has not proceeded from a firm conviction of the justice of the cause espoused, but are either special pleadings subservient to sordid purposes, and to the gratification of disappointed feelings or of private resentments, or the outpourings of minds teeming with mistaken views, arising out of imperfect observation and hastily formed opinions, and excited by a desire of acquiring notoriety in a contest involving the interests of the whole community.

74. Let any one altogether unprejudiced as to the infectious or contagious properties of pestilential maladies, attentively peruse most of what has been written respecting them in this and in other countries, carefully examine the evidence adduced before committees of the House of Commons, or in other places, and critically weigh the import and truth of the conclusions arrived at by commissions sent to investigate facts on the spots of their occurrence, and the various circumstances connected with the facts adduced — let any one who possesses sound common sense with some share of science, but who is at the same time entirely free from the undue influences of prejudice, of temper, and of interest, enquire into the matter — and I cannot believe that he can arrive at a different conclusion from that to which I have arrived, after the best attention I have been able to bestow upon this most important and much discussed subject. Whoever may enter upon this very unpleasant investigation, with these moderate qualifications, which, however necessary, are quite sufficient to the formation of just conclusions respecting it, will be surprised to find that, amongst members of a learned profession, so much ignorance should be displayed in the literary character of some of these writings, in the scientific and professional execution of others, and in the illogical inferences of many of them. The duly qualified and candid investigator will detect statements made without proof, facts assumed without evidence, and supposititious agents believed in as real existences, and these made the bases of reasonings altogether inconclusive even as regards the conduct of the argument. He will find things, facts, and diseases dissimilar from one another, and presenting no connection either as to nature or to sequence, viewed as identical with each other. He will detect the suppression of important facts and circumstances, and an undue prominence given to others of a doubtful character. He will remark the imputation of motives which did not exist, and ignorance of those which influenced, if they did not impel the writers. He will observe the precipitancy with which the young, the inexperienced, and the ignorant have rushed into print, and attacked with disgusting flippancy and intemperance much abler and better informed writers. In every medical periodical existing during the late war, he will find accounts of a disease never seen by the describers, their own mistakes, proceeding from profound ignorance of the name and nature of the malady seen by them, serving as the basis of their lucubrations and of their arguments. And he will, moreover, be grieved to remark the opinions of learned and experienced men either misrepresented or impugned in jejune and paltry performances, evincing a most remarkable ignorance of the language in which they are written, and a still greater ignorance of that from which they profusely and inappropriately quote. In thus attempting to reach the pure spring of truth at the bottom of the deep well of research, he will have to penetrate not only through the rubbish thrown in by unfaithful, by mistaken, and by ignorant inquirers, but also through the accumulated filth of uncandid and intemperate controversy.

75. *a. The history* of the various manifestations of this pestilence conveys to the experienced physician a certain degree of evidence as to their infectious characters, although the circumstances connected with them have been very imperfectly recorded. The earliest notice of the appearance of the hæmagastric pestilence in the West Indies is made by LIGON in his "History of Barbadoes." He states that it broke out early in September, 1647, and that before the expiration of a month the living were hardly able to bury the dead. After the year 1647, no mention is made of this malady until 1686, when it was said to have been imported to Martinique from Siam, and was then called the "*Maladie de Siam.*" M. DESPORTES, who practised during many years in St. Domingo, says, that it appeared in Martinique in consequence of a large fleet from Siam which arrived there with a "malignant or pestilential fever, of which a great number of the sailors perished;" and several French writers state that, having been communicated to the inhabitants of Martinique, it was afterwards carried to St. Domingo. Captain PHILLIPS states that this malady prevailed in Barbadoes in 1694; and Mr. HUGHES, on the authority of Dr. GAMBLE, mentions the prevalence and fatality of it in 1695; and the circumstance of its being called the *new distemper*, or *Kendal's fever*. Dr. TRAPHAM, in a work on the health of Jamaica in 1679, says that "about eight years since, when the victorious fleet returned from the signal Panama expedition, they then brought with them a high if not pestilential fever, of which many died throughout the country: but this being a foreign distemper brought from abroad, the causes of which I could not so well judge of, but conclude Jamaica more happy than to be annoyed therewith, directly and originally" (p. 81.).

76. Don ULLOA affirms that this pestilence was unknown at Carthagena and Porto Bello before the year 1729. Medical literature furnishes very few instances of the appearance of this pestilence in the West Indies during the eighteenth century, until the dreadful outbreak in 1793. Still we are not to infer that occasional visitations of it did not take place, although no published record of them exists; indeed, imperfect notices of such visitations are to be met with in several works; still they appear to be few and far between, and evidently prove that they have not been the results of endemic causes, or of circumstances connected with locality or season, and to have been altogether different from the maladies arising out of these causes and circumstances.

77. Dr. CURRIE, in his work on Bilious Fever, states that "a contagious fever, called the yellow fever, has occurred at Philadelphia six times since

the first settlement of the city: — viz. in the years 1699, 1741, 1747, 1762, 1793, and 1797." Gough, in his history of the Society of Friends, says, "that the fever which prevailed in 1699 had, for a considerable time before, been very mortal in the West India Islands." Dr. Lind states that, in the year 1741, "the disease was introduced by means of a trunk of wearing apparel received from Barbadoes, which had belonged to a gentleman that died of it in that place; and that the disease spread from the family that received the trunk into the town, and destroyed above two hundred of the inhabitants." Mr. Lardner, mentioning its prevalence in 1747, adds, "that many, whose business and families would permit them, fled from the city." In an account of the prevalence of this pestilence in 1762, communicated to the College of Physicians by Dr. Redman, it is stated that "the disease was introduced about the end of August, by a mariner, who arrived from the Havannah ill of it, and took lodgings near the new market, below Pine-street. It was confined principally to the vicinity of the new market, and the street west of it, spreading gradually from one family to another, till towards the end of September."

78. Dr. Lining, of Charleston, has described this distemper in a letter to Dr. White, and given the following account of its appearance in that city up to the period at which he wrote: — "This fever does not seem to take its origin from any particular condition of the atmosphere, independent of infectious miasmata; for within these twenty-five years, it has been only four times epidemical in this town, viz. in the years 1732, 39, 45, 48, though none of those years (excepting that of 1739, whose summer and autumn were remarkably rainy) were either warmer or more rainy, (and, some of them, less so,) than the summers and autumns were in several other years, in which we had not one instance of any person being seized with this fever. But that this is really an infectious disease seems plain, not only from this, that almost all the nurses caught it and died of it, but likewise, as soon as it appeared in town, it soon invaded new comers, *those who never had the disease before*, and country people when they came to town, while those who remained in the country escaped it, as likewise those *who formerly felt its dire effects*, although they walked about the town, visited the sick in all the different stadia of the disease, and attended the funerals of those who died of it. And, lastly, whenever the disease appeared here, it was easily traced to some person who had lately arrived from the West Indies, where it was epidemical." (*Essays, Phys. and Lit. &c.* vol. ii. p. 370.) Dr. Warren gives similar testimony to that now stated by Dr. Lining respecting this pestilence as it occurred in Barbadoes and adjoining islands during the early part of the last century. (*See Treat. on the Malignant Fever in Barbadoes and neighbouring Islands, &c., by* H. Warren, M.D., 8vo. Lond. 1740.)

79. Although this pestilence has frequently broken out in the West Indies and in several of the sea-ports of the United States during the last century, still considerable intervals, especially as regards individual towns and localities, intervened between its appearance. De La Fosse makes no mention of its occurrence in St. Domingo between the years 1775 and 1785. Dr. Chisholm asserts that no contagious fever, nor any epidemic of the character of this pestilence, appeared in Grenada from the year 1763 until 1793: and Dr. Gilpin, who resided many years in this island previous to 1793, confirms his assertion.

80. That the West Indies were not very unhealthy for many years previously to 1793 is shown by the testimony of Dr. Davidson, who, in a letter to Dr. Mease of Philadelphia, states that, in the more healthy islands of St. Kitts, St. Vincent, and Barbadoes, soldiers have arrived from Europe and remained there for years in the enjoyment of good health, notwithstanding their debaucheries. And Dr. Weir, Director-General of Army Hospitals, states, "that he arrived in Jamaica in 1785, from which time till 1792, only one officer died out of four regiments quartered in that island; that the troops were in general healthy; that although fevers were frequent they were not fatal," and that no fever of a bad type occurred during these years, until 1793, when this pestilence appeared. Dr. Theodore Gordon served in Barbadoes, Dominica, and Jamaica, during five years preceding the occurrence of this malady in 1793, and considered the health of the troops remarkably good, the chief diseases being remitting and intermitting fevers, dysentery, and affections of the liver. That this malady is not a constant resident in the West Indies, although frequently appearing there, is further shown by Dr. J. Hunter, Dr. Franklin, Dr. Gordon, and others, who have found troops remain during several years remarkably healthy; and yet, in the most healthy seasons and localities, this malady has occurred and swept off many hundreds in a very short period. Its outbreak in these islands, after many years of immunity from it, occurred in February, 1793, in Grenada, at a time when bilious remittent fever does not prevail; at which time also, and for a considerable period afterwards, all the other islands continued healthy. But after the appearance of this pestilence, every station, however healthy before, suffered severely from the contagion. It did not reach Dominica until the end of July. Barbadoes was unaffected until the beginning of 1794; and St. Domingo did not suffer from it until late in this year; and then in consequence of the introduction of the contagion by a detachment of troops from the island of Guadaloupe, where it was raging. This pestilence appeared in Philadelphia in the month of July, 1793, and during the latter part of that year and 1794 it reached most of the West India islands.

81. The re-appearance of this malady in the West Indies, after an immunity from it during many years, was attended by many distressing results, owing to the circumstance of its having been confounded, by superficial and inexperienced observers, with the common remittent fever of the country. We frequently find, upon referring to reports of medical officers, that the pestilence broke out and was most destructive amongst regiments which had marched into barracks, in which it had already prevailed. Thus the 35th regiment landed in Guadaloupe on the 12th of May, 1795, and on the 30th of June of the same year, in six weeks, it had lost 136 men. The 2d regiment landed at Martinique in March, 1805, and in the following May it had lost 97 men. These men landed

during the prevalence of this pestilence in these islands, and without any exposure, they instantly, and without marching or service, occupied quarters in which this malady had prevailed; but, as it was supposed not to have been infectious, the highly predisposed troops were instantly introduced to the operation of its efficient cause. The distemper was viewed as having been free from infectious properties and as being the common seasoning fever of the climate, and no precautions were taken, in these instances as well as in many others, against its dissemination. Numerous other instances might be adduced of the dreadful effects resulting from monstrous ignorance on the part of those who ought to have been informed by the experience and judgment of those who had gone before them, if they were incapable of arriving at rational inferences by their own unassisted reason; but the subject is humiliating to human nature, especially when viewed with reference to medical doctrine and to professional character. In those days, and even down to the present day, the arrival of Europeans within the tropics was generally inferred to produce what was called a *seasoning fever*—a name imposed upon all fevers, however occurring, within the first twelve or eighteen months after the change of climate—a name, moreover, applied very frequently to conceal ignorance or even to mislead. But fever solely depending upon change of climate merely, irrespective of infectious or other miasms, is neither so immediate in its invasion of new comers, nor so rapid in its course, nor so malignant, nor so fatal, as the pestilence now under consideration. In this, I speak from observation in two quarters of the globe. But to proceed with the evidence as to the infectious nature of this distemper.

82. Dr. J. STUART, who practised during many years in the island of Grenada, both before and after the prevalence of the pestilence in that island in the years 1793, 1794, and 1795, states in a letter to Dr. CHISHOLM, "As to the character of this fever, my experience has fully satisfied me that it was specifically distinct from every form of the indigenous bilious remittent which I had ever observed,—because it appeared at a season of the year which I had always found healthy during a period of nineteen years' residence in the colony; because it did not appear particularly in those situations where bilious remittent fever usually prevailed during the unhealthy season of the year; because there was an evident difference in the character and type of the two diseases; because I never knew this fever terminate in intermittent, as remittent or bilious fever commonly does; and because I did not find the same mode of treatment successful in both kinds of fever." Dr. STUART goes on to remark, "that a thorough belief existed in the minds of all the medical gentlemen in Grenada that the malady was infectious," one only, and he merely *at first*, doubting this property; that he himself and several other medical men contracted the disease in their attendance on the sick; and "that the malady, in his decided opinion, was propagated by visiting infected apartments, or by the near approach to, or contact of, people labouring under it." (See Dr. CHISHOLM's *Letter to* Dr. HAYGARTH, p. 24.) Dr. GORDON, of St. Croix, government physician to the Danish West India Islands, concludes his remarks on the malignant pestilential fever prevalent in these islands and in North America near the close of the last century, by stating his belief in the importation and diffusion of infection, "by ignorance, perversity, selfishness, or the abstraction of the sentiment of public good; by the abuse of all preventive measures in the promotion of the speculations of cupidity and the calculations of venal men; by the prostration of truth and humanity, and the eluding the laws of quarantine."

83. Dr. DANCER, of Jamaica, after a close examination of the opinion emitted respecting the malignant pestilence of 1793—6, states most decidedly that "it is an imported disease and is communicable by contagion." He adds, "that it has no apparent connection with local causes; that it has appeared in the healthiest seasons and localities, and has prevailed least in unhealthy and marshy places."

84. *b.* Dr. CHARLTON, president of the Medical Society of New York, states, in a letter to Dr. HOSSACK of the 9th September, 1803,—"I have practised physic in this city since the year 1762. The fevers that have usually occurred in summer and autumn during this period, were intermittent, bilious remittent, and nervous or typhous fevers. I never saw a case of yellow fever in the course of my practice before the year 1793." He adds, that he always considered the yellow fever as "a disease of foreign origin;" and that he "never met with a case of it in the country but which could be clearly traced to infection from the city."

85. Dr. S. BARD, who commenced practice in New York in 1766, remarks, that although he observed hospital and jail fevers there during the revolutionary war, he never saw a case of true yellow fever until 1795; that he considers it a distinct idiopathic disease, and not a variety or grade of any other; and that he believes it to have been an imported malady. Dr. HOSSACK states that Dr. LEDYARD at first believed this pestilence, as it appeared at New York, was generated in the place; but subsequently had reason to change his belief, as all his observations at the Health Office satisfied him that it was exclusively derived from the West Indies (p. 32.).

86. It has been supposed that the fatal prevalence of the pestilence chiefly in cities, towns, and localities near the level or on the margin of the ocean, is a proof of its origin in such situations; and that it does not admit of appearing at any considerable distance from these places; but that it would frequently be propagated through inland districts if the malady possess infectious properties. The truth, however, is, that it has not unfrequently been conveyed to places around, and inland, from the sea-ports where it broke out and prevailed in Africa, America, and the south and east of Spain. Dr. STRATTON met with numerous instances of the propagation of the pestilence, when it appeared at Philadelphia in 1797 and 1798, to persons residing at considerable distances, and who had not visited the locality in which it prevailed. Thus he states that twenty-seven persons had retired from Philadelphia and Washington with the disease, and fifteen received the infection by communicating with them. "One young lady fled from Wilmington into New Jersey, was attacked about a week after, and communicated the malady to her uncle, her nurse, and a young man who visited her. Two of the four died;" and he adds, "there have been many instances of the pestilence being brought from Philadelphia to

Jersey, and of its being communicated from the persons thus infected to others; and, if it may be thus conveyed from the former to the latter, I see no difficulty in supposing that it may be brought from some other place to Philadelphia."

87. The College of Physicians of Philadelphia in 1798 came to the following conclusions:—"1st, That the pestilential yellow fever lately prevailing in that city differs essentially from every other disease which is common to North America, and agrees in its most essential symptoms with what is called the yellow fever in the West Indies.—2d. That it has been regularly traced to the vicinity of some vessel or vessels from the West Indies, or to persons or clothing connected with them.—3d. That the principal peculiarities of this fever are its contagious nature, the progress of the symptoms, and the mortality consequent on it.—4th. That to prove the contagious nature of this disease would be equally useless as to prove the contagion of the plague.—5th. That, in all their observation and practice, they know of no case where the autumnal bilious remittents of the country have proved contagious.—6th. That although these are sometimes attended by violent and dangerous symptoms, this striking characteristic of contagion being always absent, they never become an object of public dread or concern." Preceding these conclusions, these physicians put the following pertinent questions:—"Where do we see the first appearance of this pestilential fever? Is it among the marshes to the southward of our city, or in the neighbourhood of our wharfs? Is it in the confined alleys, or on the salubrious banks of the Delaware at Kensington? Is it not always near those places where vessels from foreign countries are found? Do the fevers common to the country steal on insensibly, infecting one person after another in a family and in a neighbourhood? Are they equally severe in seasons so opposite as in 1797 and 1798?" They likewise remark, "that very erroneous opinions have arisen, from confounding this pestilential fever with the malignant remittents of the West Indies and America;" and they further subjoin proofs of the importation of the infection in 1798.

88. Dr. BANCROFT insinuates that Sir W. PYM had formed his ideas as to this pestilence, from the accounts furnished by Dr. CHISHOLM, of its introduction into Grenada. Sir W. PYM, however, witnessed its appearance in Martinique in 1794, before he had even heard of Dr. CHISHOLM; and his extensive experience of it in the West Indies fully confirmed this physician's account of it. Indeed, when Dr. BANCROFT first wrote upon this distemper, it is even doubtful whether or not he had ever encountered it, or seen any other fever than the remittents of warm climates, which he had confounded with it; at any rate, his experience of it was very limited. Sir W. PYM's account of his experience of this pestilence, both in his own person, and in the several armies and expeditions with which he served in the West Indies, conveys the strongest internal evidence of his thorough knowledge of the origin and nature of it. Of his later experience in Spain and the Mediterranean, and of the successful measures which were on several occasions adopted in order to extinguish this calamity, it is unnecessary here to speak, as they will partly appear in the sequel.

89. Sir W. PYM distinctly states, that, when this malady broke out in the islands where he served in 1794 and 1795, other physicians, both English and French, considered it distinct from the endemic of the country. He mentions respecting one of these isles, that it originated in three companies of the 70th regiment quartered in bomb-proof barracks, and extended from them to men in hospital with other complaints, and, in succession, to the surgeon and hospital attendants. It next invaded the troops quartered in more elevated situations in the same fortification; whilst the only persons in the town of Fort Royal that suffered from the distemper, were officers who had joined the mess or visited the sick officers of the 70th regiment. Sir W. PYM advised the men to be encamped on an elevated and airy place at a distance from the town; and in a few days the malady disappeared from the camp, and the regiment continued free from it until the arrival of convalescents from the hospital with their blankets and knapsacks, which, having been distributed among the different companies, communicated the pestilence so very generally, that in a very short time none escaped it but those officers who either had it very slightly, or had resided some years in the West Indies.

90 This was the first regiment who had suffered from this distemper in that campaign; but the infliction was viewed as a seasoning fever by some; as the endemic of the country, aggravated by fatigue, by others; as the result of malaria, or of any thing else under the sun excepting what it really was, by many. The few who entertained correct views were disregarded, and were not in positions to procure attention from ignorant superiors, and the results were exactly what might have been anticipated. The distemper extended, "and soon ran through every corps that had arrived from England, and even through the regiments that had been some years in the West Indies; with this difference, that the last-mentioned suffered a smaller mortality." Nevertheless the total loss of the army in the course of a few months was not less than 6000 men. "The inhabitants also suffered severely; but the mortality was small among the natives and those long resident in the island; but the newly arrived, sea-faring persons, and men belonging to transports, suffered in as great a proportion as the military." He adds, that people of colour also suffered from fevers, but in a much slighter degree, and less dangerous form. "During 1794 and 1795 reinforcements continued to arrive, and from occupying the same barracks and quarters with the troops which had suffered from the disease, the contagion was frequently communicated to them immediately upon their arrival, and there were many instances of officers and men not surviving a week after debarkation."

91. The opinions of several physicians are adduced by Dr. BANCROFT in favour of the non-infectious nature of this pestilence; but, upon referring to them, it will be found that they actually support a very opposite doctrine; and that their ideas, as to a non-infectious character, had reference entirely to the remittent endemics of which they were treating, and not to epidemic yellow fever — a piece of sophistry of the most dishonest and contemptible kind. Thus Dr. GILLESPIE, who is thus misrepresented by this author, and adduced by him as an evidence against infection, states, that "infection could in many instances be traced, and appeared to operate as well through the medium

of terror as that of the *effluvia emitted from the bedding and persons of the patients.* Of this a melancholy instance happened in an armed sloop, into which a draft of about fifty men had been judiciously sent to cruize, and thereby to be preserved from sickness; but the *contagion having been carried on board* previously to her sailing, and being destitute of medical aid, the men were attacked in succession, and three-fourths of them died;" whilst in other armed vessels in which similar drafts had been sent with the same intention, the people continued in good health. Dr. PASCALIS, who is also quoted by Dr. BANCROFT in favour of non-contagion, states as follows:—"It has appeared to me, as well as to many practitioners, that a considerable number of the cases could not be traced *but to a contagious power of the fever itself:* such were the cases of whole families, who seemed preserved as long as they had no patient in their houses, and who all perished or were sick, without exception, as soon as they admitted among them any one affected with the disease. This deplorable effect has been seen in the most wholesome parts of the town (Philadelphia), and at any period of the season; so that, in many instances, where the disease seemed most universal, by care and precaution people were preserved; while in the country they fell victims to their unreserved intercourse with patients when the epidemic was fast decreasing in every part of the town." Dr. LEMPRIERE, another of Dr. BANCROFT's authorities, testifies, in opposition to the special pleadings of this writer, that "he could not admit a doubt in his own mind of the disease being of a contagious nature;" and M. GILBERT adds that "he cannot deny that the malady may be communicated by the expired air, or by the contact of matters impregnated by the miasms exhaled from those affected."

92. Of the several outbreaks of this pestilence in the United States it is unnecessary to state more than has been already advanced, especially as the details connected with one of them are in every respect similar to those of the rest, as well as to those connected with the appearance of the distemper in Europe. The localities in which the malady first broke out in North America have been viewed as the sources from which it emanated, independently of importation or infection, by those who argue against this property, and who consequently consider it incapable of being thus propagated or imported; and however small the grounds furnished them for believing that these localities were or are capable of furnishing the exhalations, miasmatous or terrestrial, or however denominated, still they contended that it acknowledged this and no other source—that it was propagated by the air of the locality, contaminated by exhalations from the soil and matters covering or existing in that soil, and not by emanations proceeding directly from the bodies of the sick, or imbibed by substances capable of retaining them for a time and afterwards imparting them to the surrounding air. That the distemper, however, appeared in various places in that country where no evidence of terrestrial exhalation could be produced, and even where the presumption of such having ever existed seemed absurd, unless, indeed, it can be credited that a specific flatus or gaseous poison may be exhaled at certain particular parts of the earth's surface, without affecting the senses in a perceptible manner, or all who may be within its sphere, and produce a certain specific effect, identical in every respect, on all occasions, and in all quarters of the globe. However gross and absurd this assumption may appear, it actually forms the basis upon which the non-infectionists found their doctrine. If the truth of this doctrine be for a moment conceded, it necessarily follows that this terrestrial exhalation or poison may proceed from any situation, soil, or place, without reference to physical condition or geological formation, seeing that its specific effects have appeared in all kinds of locality whenever the range of temperature favoured their evolution. The yellow, or hæmagastric fever broke out in September, 1811, at Perth-Amboy, in New Jersey, U.S., a town and surrounding country presenting none of the endemic sources of disease, but holding frequent communication with the West Indies. On this occasion, the board of health at New York, consisting of several of the most eminent men and physicians of that city, recommended the mayor to issue his proclamation interdicting all communication between the city of Amboy and the city of New York; and to appoint a committee to inquire respecting the malignant and infectious fever which had appeared in the former city. Dr. MANNING, physician in Amboy, reported to the committee that it was the pestilential yellow fever; that "there was but one opinion with either the inhabitants or physicians as to its origin, namely, that it was derived from some of the West India vessels which had been lying at the wharfs; and that the brig Ocean from St. Bartholomew's, and the ship Favourite from the Havannah lying along side of the Ocean, were generally supposed by the inhabitants to have introduced it." He stated that there were no local causes to which this calamity could possibly be referred, that the city is very elevated, the soil chiefly composed of sand; free from all lodgments of water; the streets wide; and the houses for the most part spacious; and that the whole town exhibited an uncommon degree of cleanliness. He further reported that the citizens were so perfectly convinced that the fever was imported in the vessels at the wharfs, that they were removed to the stream; and that the persons first attacked were frequently on board of the vessels above named. The committee, after visiting Amboy, reported, "that other persons taken ill had been exposed either directly by being on board the vessels, or by visiting those who were ill of the disease." About this time, also, the Board of Health of Philadelphia issued a proclamation, prohibiting all communication between Amboy and the city and county of Philadelphia on account of a pestilential disease prevailing in the former city, and imposing a quarantine of fourteen days on all persons after leaving Amboy, before they can be admitted into Philadelphia.

93. *c.* Of the earlier occurrences of this pestilence in the *south of Europe*, but imperfect information has been furnished. It appeared in Lisbon in 1723, black vomitings being the most prevailing and fatal symptom. Dr. KENNEDY, physician to the English factory there, states, "that it was very contagious in the lower parts of the city, going through a family, and very few families escaping," especially in the ill-ventilated streets. It showed

itself at Cadiz in 1764, and did not again appear in that city until 1800. A vessel arrived there in August of that year from the West Indies, and on board of her some persons had died of the yellow fever on the passage. After her arrival at Cadiz, the whole crew, passengers, and pilot were landed, and died of the disease. The infection rapidly spread throughout the city, and extended to several neighbouring and inland towns.

94. This pestilence appeared at Malaga* in 1803. The governor of that city informed his relative, the consul general of Spain in London, that it was brought there by a French ship from the West Indies. After disappearing during the winter, it re-appeared in the following summer. In this year, 1804, it spread to Gibraltar from Cadiz, and to several parts of the Mediterranean, to Leghorn and St. Lucar. Sir W. PYM, then superintendent of quarantine at Gibraltar, met with one case of the distemper in this fortress in 1803; and, as Dr. HENNEN remarks, this may not have been the only case; for many attempts were made to impose upon the authorities and keep them in ignorance, and the malady was at that time prevailing at Cadiz and Malaga, cities not far removed from Gibraltar.†

95. The deaths amongst the military and their families during the two preceding years, were 35 in 1802, and 56 in 1803; but, in the last four months of 1804, the deaths were as follow, from this pestilence:—Officers 54; soldiers 864; soldiers wives' and children 164; civilians 4864;—being altogether 5949. Dr. NOOTH and several surgeons, both military and naval, believed that this pestilence, which had thus in four months carried off nearly half the population, to have been local as to origin and non-infectious; whilst Sir W. PYM and Sir J. FELLOWES, and the surgeon of the artillery gave their decided opinions that it was highly infectious, and that it had been introduced from abroad. But the scientific and experienced reader—especially if he have ever seen cases of this pestilence—will be much surprised, and at once know how to estimate Dr. NOOTH's opinions on these topics, when he reads in that physician's first official report, that he considered the fever "as decidedly inflammatory as it possibly could be;" that he believed many of the medical officers to have lost their senses for believing the malady contagious and of a putrid character; that he laboured to convince the public that there was nothing to be dreaded from a communication with the sick; and that he (evidently then a stranger to the malady!) dictated peremptorily to the medical officers below him (for most unfortunately for thousands, he was at the head of the medical department) the mode of treatment they ought to pursue. In his *second* official report something of the results of these hastily formed opinions and measures becomes apparent; for he states the losses in certain corps to have been "enormous," and, amongst the inhabitants, the ravages of the distemper, "as beyond description terrible." He, moreover, now begins to waver as to the source of the malady, and either gives very opposite opinions, or is altogether ignorant of the meaning of the terms which he employs. Thus, after stating that he had himself "contracted the fever in that *focus of contagion*," he adds that "the disease by no means seems to be *infectious*, but the whole atmosphere on the rock is *pestiferous*; and I am inclined to think that, in addition to the ordinary causes of *contagion*, we may consider a large *lime kiln* in the upper part of the town as aid and part in the general mischief!" And this is Dr. BANCROFT's great authority for the local and marsh origin of this pestilence and for its non-infectious nature! The whole of the four letters to the surgeon-general written by this physician—this infliction on the profession and the military service—abounds with similar drivellings and peculiarities. How admirably successful his endeavours to restore "the lost senses" of his "weaker brothers in medicine!" and "*to convince the public that nothing was to be dreaded from communication with the sick*," must have proved, may be inferred from the fact that, out of the civil population of this important fortress, amounting to nearly 14,000, only twenty-eight escaped an attack of the pestilence, and twelve of these had previously been affected either in the West Indies or in other parts of Spain. Fortunately for this place, at the height of a sanguinary war, Sir W. PYM and Sir J. FELLOWES arrived to save 1200 of the soldiers, by segregation, from an attack of the distemper. Mr. KENNING, surgeon to the Royal Artillery in this fortress, published a detailed

* The introduction of the pestilence into Malaga in 1803, is stated by Dr. AREJULA to have commenced in the house of C. Verduras, a noted smuggler, who had brought from one of the vessels in the bay, and secretly conveyed to his house, a person labouring under a disease of which he soon afterwards died. It was subsequently discovered that the body was privately buried in the adjoining church of St. Peter. On the 26th of August, and next three days, the son of the smuggler and two other men, associates of his, were attacked, and two died. Soon after the death of the son, on the 3d of September, his mother and two sisters sickened with the same symptoms, according to the report of the physician. Verduras the father died on the 15th of September, and his daughter and another son, who also had been attacked, died on the 19th. Whilst the distemper was thus running through this family, persons adjoining and friends of the family were seized, the malady spreading gradually from this house and locality. Dr. AREJULA states that the person who was secretly landed and died in Verduras' house was buried by and with the connivance of the curate, who was himself taken ill a few days afterwards, and died together with the physician who attended him; "and in like manner every person connected with the curate's family was taken ill and died; even the sacristan and his wife, as well as the boy who attended the priest at the altar." Those also who entered the church of St. Peters, where this person was buried, to hear mass on St. Michael's Day, were all taken ill, and a great part of them died. This church was therefore shut up, and continued closed until December 1805, when Dr. AREJULA entered it, and directed the fumigation of it. The account furnished by this physician was confirmed by the researches of Sir J. FELLOWES, who obtained the same information as he had obtained, and traced the distemper to the same source.

† The facts connected with the introduction of the pestilence into Gibraltar in 1804, are thus stated by Sir James Fellowes:—"From the confession of *Santos* the person first attacked, and from the oath of a respectable witness, it appeared that *Santos* had recently left an infected house at Cadiz; that he had been three times in company with a person actually labouring under the disease on the 23d and 24th of August; that he arrived at Gibraltar on the 25th, was taken ill on the 26th, and was seen by a French practitioner, M. JARG, on the 27th, and that in less than eight days after his being attacked, his mother, two aunts, one brother, and two sisters, all residing in the house, were also seized with a disease of a similar nature." (p. 103.) "The malady spread from the house of Santos to the adjoining buildings, whilst the rest of the garrison were totally exempt from it. For several days the distemper was confined to the range of buildings to which it had been traced, and where Santos lived; and it was observed to make a gradual progress amongst the different families who resided there, and to spread to the sheds in the neighbourhood." The further progress of the distemper to the military as well as civilians may be learnt in Sir JAMES's work. (See p. 104, *et seq.*)

account of the introduction and subsequent progress of the pestilence; and Mr. BURD, who was at the head of the medical department of the navy, wrote officially to Lord NELSON commanding the fleet, cautioning him against communication with ships from Gibraltar. But, although Dr. NOOTH's "*weaker brothers in medicine*," were bound to obey their superior officer, as to his measures, they were not constrained to conform to his opinions.

96. Although this pestilence had appeared several times at Cadiz, after long intervals, and at Malaga, places only about forty or fifty miles east and west of Gibraltar, when it might have been inferred that this fortress could not have escaped if the cause of the mischief had existed in the atmosphere, and that no police or quarantine regulations could have excluded it; yet we find that this place, as well as many adjoining places in Spain, had escaped up to 1804, owing to such regulation in parts, if not altogether. Measures of purification were adopted after the subsidence of this epidemic, and proved successful, so that the garrison enjoyed perfect health from that time until 1810. In this year the pestilence ravaged Cadiz* and Carthagena; and during its prevalence there, four transports from the latter port, two of them having on board deserters from the French army, anchored in the bay of Gibraltar. Sir W. PYM put them in quarantine, and the distemper appeared in all of them in a few days. He instituted measures for the separation of the healthy, and for preventing communication with the fortress. Notwithstanding these the disease appeared on shore; but a strict supervision was instituted, and the sick were separated from the healthy, and removed to the neutral ground. A cordon of troops was placed around the infected part; and proper persons appointed to superintend the purification of houses, furniture, &c., and to report the appearance of the distemper. Owing to these measures the pestilence was arrested before it had infected many in the fortress. In 1804, the infectious nature of the distemper was denied by the head of the medical department, and communication with the sick encouraged, and nearly all were infected, and nearly one half died. In 1810, the infectious character was recognised, the infected were segregated and removed to an airy locality, communication with these was prevented, the healthy protected, and the mischief was very soon arrested.

97. In 1813, the disease again made its appearance, and its commencement and progress were described by Dr. GILPIN and Mr. FRASER, Deputy-Inspector of Hospitals. The persons who brought the pestilence into the garrison were ascertained. One of them was ill when he arrived, and he communicated the distemper to those residing in the same house; thence it extended to both sides of the street in which the house was situated. All escaped who cut off communication with the infected. Of 500 persons confined to the dockyard, not one instance of infection occurred, although this was the spot most likely to be productive of terrestrial effluvia, and that suffered the most in 1804, owing to communication having been then unrestricted. When the pestilence appeared there were about 5000 persons within the walls, who had been subjects of it at a former period; and after a careful inquiry there did not appear to be one well authenticated case of a person having been infected a second time, at the termination of the epidemic. At its commencement nearly 8000 persons left the garrison, the greater part of them encamping upon the neutral ground. Very few cases occurred amongst them, and these chiefly after their emigration, and from previous infection. The strong breezes and current of air in this place were expected to prevent the accumulation and concentration of infectious effluvia, especially in tents, and consequently to arrest the progress of the malady; and the results proved the correctness of the inference.

98. In August 1811, the disease appeared at Carthagena, and Mr. VANCE, who had been infected by it in the West Indies, was sent to that city to report respecting it. He stated that it had not been confined to any particular part of the town, and that no persons were exempted from it, but those who had been previously affected by it. He, however, mentions the important facts, that bilious remittent fever, which has been so frequently confounded with this distemper, also prevailed at this place, and that many soldiers were in the Royal Hospital labouring under the gaol-fever. Mr. VANCE imputed the appearance of the malady in Carthagena this year, to the general neglect of destroying the bedding, clothes, &c. of those who had died of it during the previous autumn; the infection lying dormant during the cold weather, and until called into activity by the summer's heat. He further states, that the malady was introduced into Murcia, where it became destructive, by refugees from Carthagena; and that these cities had been placed in quarantine by the Spanish authorities.

99. Of the hæmagastric pestilence that has appeared on several occasions in Gibraltar and other parts of Spain, and has created so much interest and controversy, it may further be remarked, that much additional information, to that already furnished by Sir W. PYM, Dr. GILPIN, and Sir J. FELLOWES, has been adduced by Dr. HENNEN, Mr. REDMOND, Mr. FRASER, &c.; and by the reports of the several commissions sent to inquire into the nature

* In September, 1810, the harbour of Cadiz was crowded with ships from several ports of Europe and America, and several regiments of British troops were in the town. On the 11th, the physician to the board of health discovered some persons with fever similar to that of 1800 and 1804; and it appeared from the reports that this malady was infectious, having spread gradually in the quarter where it broke out, four out of five of the first family attacked having died; the only surviving individual not having been seized; and it having been ascertained *that he had passed through the disease in* 1800. Sir J. FELLOWES communicated this information to the British authorities; and measures, such as the circumstances of affairs allowed, were adopted to preserve the health of the army and of the crews of British ships: but these precautions, owing to various circumstances, could not be sufficiently enforced. The British troops, however, continued free from the disease, although it surrounded them until the end of October. Dr. SNOW, physician to the army, in his official report states that, "as far as his experience extends, and from all the information he has been able to collect, he thinks this disease contagious; and that nothing but the very active measures which were taken to check it in the beginning could have prevented its destructive influence from being more severely felt by the troops." Dr. PLENDERLEATH, physician to the forces, had charge of the hospital at the hospicio at Cadiz, and he reports that the fever then prevailing was identical with that of 1800 and 1804; that it was violently contagious; and that the dangerous consequences to the army were prevented by the timely precautionary measures adopted; the army having lost only 25 men, although upwards of 4000 were carried off by it from among the inhabitants. The Spanish physicians also believed the disease to be contagious, and imported.

and source of the outbreaks of this pestilence in the south of Spain and Barcelona. And it may be premised, that the several epidemic manifestations of it which have occurred in the West Indies, in the ports of the United States, in Africa, and in several places in Spain, being admitted to have been identical as to nature, it necessarily follows that the evidence as to its source and propagation in one locality or epidemic equally applies to all other localities and epidemics. Mr. REDMOND states in his letter to Sir W. PYM, that the fever under which the 54th regiment suffered in Gibraltar in 1804, and again in Jamaica in 1808, was the same disease, and that it was infectious on both occasions. Of this he adduces the most convincing proofs. He notices the circumstances of the fever having been introduced by infection into the regiment in Jamaica, in 1808, that it infected all who had not previously been attacked by it; that, in a few weeks, his two assistants, and twenty out of twenty-one hospital attendants, were infected; and that none of those who had had the disease in Gibraltar, were attacked in Jamaica.

100. In the reports made by order of the governor as to the first appearance of the pestilence in the fortress, Mr. KENNEDY, who recognised its nature, and watched its progress from the commencement, adduces the following evidence:— At the beginning of September of 1804 the distemper appeared in the vicinity of Boyd's Buildings; and a bombardier and his wife, residing next door to the house of the person Santos said to have imported the malady from Cadiz, where it then prevailed, and who was then labouring under it, were the first attacked in the artillery. Those who visited the bombardier and his wife were the first taken ill in that corps; and that part of the corps quartered nearest to their residence was the most unhealthy. Mr. REDMOND, surgeon of the 54th regiment, traced the disease from man to man, and reports as follows:— Whenever a man was admitted into hospital his comrade or bed-fellow soon followed. When an officer was affected, the servant was also affected: the same could be said of husband and wife. Of twenty-six persons employed as the hospital servants of this regiment not one escaped. When officers and families in this corps avoided communication no disease appeared, but the moment they neglected this precaution they were no longer safe. Two families lived in seclusion at Europa and escaped until, on the setting in of the rains in November, they returned to town, when the whole were attacked, excepting one who had been in the West Indies.

101. Dr. HENNEN states the following demonstrative and undenied facts:— 1st. The deaths among the military in Gibraltar on the 1st of October, 1804, were upwards of 130; and among them the garrison chaplain, who was attacked three days after attending a woman in her last moments. The five persons who carried the body to the grave were attacked on the fourth day, together with eight others who attended the funeral. Colonel FYERS, who at first had considered the malady non-contagious, was induced by these proofs of infection to change his opinion. He removed his family, consisting of fourteen in number, to Europa, established a strict quarantine, and they all escaped; while DE ROLLE's regiment who were encamped within forty yards of them, but not prevented from communication with the inhabitants and the rest of the troops had no less than 442 cases out of a strength of 635, the mortality being 197.— 2d. Capt. DODD's family, seven in number, and Mr. STRAITH's, three in number, lived in detached houses, and avoided all communication; the distance between the houses being 300 yards. On this intermediate space the 54th regiment was encamped. Of this regiment, consisting of 747 men, 456 were attacked and upwards of 100 died; and yet not an individual of DODD's and STRAITH's families on each side of this corps was affected.

102. It should be recollected that Dr. HENNEN was no partisan; but he adduced the facts which came officially before him at Gibraltar with praiseworthy candour. He further states other circumstances resembling the foregoing, and remarks, "That the sole cause, therefore, could not have existed in the atmosphere breathed in common by all, whether soldier or civilian, is rendered highly probable." The following facts further demonstrate the truth of this inference. The Spanish troops doing duty at the Lines, 3000 in number, within one mile and a quarter of the garrison, had no sick. At San Roque, five miles distant, with a population of 6000, no sickness appeared during this epidemic period at Gibraltar. At Algesiras, ten miles distant by land, and five or six across the bay, the disease appeared on the 7th of October, 1804, the prevalent opinion being that it was imported from Malaga and Cadiz. At Los Barios, four or five miles from Algesiras, no precautions were used, and the disease extended thither and to Smeras, another small town about twenty miles distant: whilst at San Roque and in the Lines opposite Gibraltar, all communication with Gibraltar, on the one hand, and with Algesiras, on the other, was completely cut off, and the distemper never appeared. Dr. HENNEN* adds, "if these facts are not in favour of segregation and moderate quarantine, I know not what can be deemed so; at least they convey to my own mind the most perfect conviction upon these points." (p. 107.) It was stated, moreover, by Sir J. FELLOWES and by Mr. BENYON, surgeon of the 10th regiment, "that every master of a transport who had business in the house of the agent for transports, whose family was attacked with the malady, caught the fever, while all those vessels in the mole, which had no communication with the shore, escaped."

103. That the clothes and bedding of the sick will propagate the distemper is shown by the fol-

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* Dr. HENNEN, who was at the head of the medical department of the garrison of Gibraltar, when the epidemic pestilence of 1828 broke out, and who died of the distemper at an advanced period of this epidemic, must have seen enough in the course of the early part of it to confirm his opinion as to the infectious nature of it, or to establish his belief in this property if it were previously not quite determined, for in an official communication *to the military secretary of the governor*, he writes as follows:

"*Gibraltar, 24th Sept.* 1828, 9 *o'clock. Immediate.*

"Sir— Nothing has yet been done about the infected bedding at the Naval Hospital. Pray allow me to order it over the line wall at Camp Bay, instantly, as much loss of life may be the consequence. The barrack master's plan of taking it direct to the sand-pit, is fraught with danger. It should be steeped in the sea for sixty hours at least before it goes to any place, when it may be mixed with other beds. (Signed) J. HENNEN, M.D."

lowing circumstance. — A quarantine encampment of those who had not passed through the fever was formed in Gibraltar on the 9th of November, 1804. These men, with the exception of the 13th regiment, took their bedding with them; but the 13th, by the precaution of their colonel, left their old dirty bedding behind, and brought clean blankets in lieu: not a man of this corps was attacked; whilst on the 22d of this month, five men of other corps were seized, and within the three following days every regiment, except the 13th, had men taken ill. (HENNEN, p. 40.) In whatever light this fact may be viewed, it suggests a most requisite precaution; and that such a precaution should have been neglected may be viewed as one of the many evil results arising out of the doctrine so assiduously inculcated by the heads of the medical staff on the outbreak of the pestilence (see § 95). The non-infectionists argue that the malady is not propagated by emanations from the sick, either direct or by fomites, and hence, that no such precaution as the one now stated is requisite. That it was most requisite — that the neglect of it in this and on numerous occasions in America, the West Indies, Africa, and in Southern Europe, was most calamitous — even most murderous, is apparent to any reflecting mind. Ten times as many lives have been sacrificed during the last sixty years by the abettors of a most erroneous doctrine — by following the false glare of what has been ignorantly deemed the lights of science, instead of adopting the suggestions of common sense — than have been lost on the field of battle.

104. Mr. FRASER, the experienced chief medical officer at Gibraltar during the epidemic of 1813 and 1814, writes as follows: — "The features of the epidemic; its course through families; the early and almost universal seizure of the medical officers, clergy, and rabbies, and of those immediately employed about the sick, if not emancipated by a previous attack; the sickening of washerwomen, the good effects of seclusion, and the remarkable escapes of those who took particular precautions, led to, and finally confirmed the belief of the infectious nature of the malady." He further states, what my own observation has confirmed, "that, of the number of medical authors who deny the contagious properties of the disease in their closets, many yield to the ineffable impression made by the immediate view of the epidemic calamity," and acknowledge the communicability of it by their fears, by their acts rather than by their words — "by their personal manners; their care of those dear to them; the placing of their patients under observation; and the adoption of other means, which could originate solely in a latent belief of infection."

105. Dr. AREJULA, an eminent Spanish physician and author of a work on this pestilence, states, that "a regiment of dragoons in the centre of infected places in 1800, continued in uninterrupted good health during the whole time of the continuance of the epidemic, guarded from its dangers by the good sense and vigilance of its commanding officers, who formed a cordon from the corps itself for the protection of its own quarter. This fact is quoted by Dr. JACKSON from Dr. AREJULA's work, with the remark, "that it is imposing, and, if the truth of it were authenticated officially by the signature of the officer who commanded, it would go far to decide the question under discussion." But the fact respecting the immunity of those shut into the dockyard in Gibraltar in 1813, (§ 97.) is equally strong and admits of no doubt. Why does Dr. JACKSON throw doubt upon a fact stated by so respectable a physician as Dr. AREJULA is known to have been, when he might have ascertained the accuracy of it when he was at Cadiz not many years afterwards? It is, however, duly credited by Mr. FRASER, who must have possessed some means of ascertaining the truth of it. Indeed, the fact does not repose upon the testimony of Dr. AREJULA alone, nor does it require the confirmation of Mr. FRASER, for it should be known that it was witnessed by the French commission sent to the south of Spain in order to investigate the nature of this epidemic, and was adduced, in the report of that commission, with many other facts, proving the introduction and infectious nature of this malady; which report is published in the original French in Sir W. PYM's work on this pestilence, and ought to have been known to Dr. JACKSON* long before he either went to the south of Spain or wrote upon this distemper, seeing that it was published both in Paris and London long previously, and again noticed by the French commission sent to Cadiz to report on the epidemic there in 1819.

106. M. PARISET, in his report of the progress of the pestilence in Andalusia in 1819, states, that it was in all respects that of an epidemic diffused by contagion. That, having appeared at a single point, it extended itself like an inundation, and gained in succession places near its source, and progressively those more distant, respecting only such places and persons as protected themselves from communication with those already infected. Thus, appearing first in the Isle of St. Léon, it pervaded Cadiz, where no means of arresting its progress had been taken; attacking two-thirds of the inhabitants, it was conveyed to Xeres and Seville. In the last-named of these cities, measures were employed to arrest its diffusion, and in Xeres similar measures were adopted, but not so strenuously carried out as in Seville; and the results in both these cities were proportionate to the vigilance and promptitude with which those measures were enforced. M. PARISET further states, that the pestilence appeared in no town or village adjoining Cadiz, Xeres, or Seville, without previous communication with one or other of those infected cities, or with some other place

* Dr. JACKSON was sent to the south of Spain in 1819, to inquire into the pestilential epidemic prevailing there at the time. He returned to England and wrote a very laboured work respecting this distemper, in which the various modifications of it, according to temperament and habit of body, are described, with numerous arguments, pleadings, &c., against infection, now and then, however, with certain admissions, proving the opposite doctrine to that for which he argues. What reliance may be placed upon his opinion as to the matter I shall leave the reader to determine, after having read a paragraph, to which I have already referred, actually admitting the presence of infectious properties in this pestilence, and which concludes as follows: — "I was indisposed myself on various occasions, never in health, though my visits to the sick were desultory and comparatively few." (*See* p. 49. *of his work*.) This having been the case, as Dr. JACKSON admits of himself, how was he enabled to describe so fully, I cannot say so accurately, this distemper? and how came he to support a most important but dangerous doctrine as to the origin and nature of a pestilence, the occasions of his seeing and judging which he admits to have been "*desultory and comparatively few?*"

already infected; that, in populous towns, the distemper prevailed in proportion to the freedom of communication with those primarily attacked; and that wherever all communication was cut off in due time, no instances of the malady occurred. (PARISET, &c. pp. 64—67.) It may be mentioned that, in the case of this epidemic, as well as of others, the distemper did not appear in distinct and separate points or localities, at the same time, unless communications had previously existed between those and some other places already infected. M. PARISET goes on to remark, that in 1819, as well as in 1820, wherever the distemper appeared, it commenced in some individual, who communicated it to those who waited upon or nearly approached him, and that those sickened with it either in succession or together. Thus the inhabitants of the same apartments, then those of the same house, then the adjoining houses and those opposite, then the adjoining streets, &c. were infected in succession. One quarter of a town, or street, or house, being infected, persons proceeding thence into other quarters or streets, or coming from these into the infected houses, either were themselves infected, or carried the infection with them. This able writer further observes: — "Open the work of Dr. AREJULA—a treatise founded on the most authentic documents and the most enlightened observation; read what this very eminent physician has adduced respecting the origin and progress of the malady in Cadiz in 1800; in Medina Sidonia in 1801; in Malaga in 1803 and 1804; and pass on to the appearances of it in the last year (1804) in Ronda, Antequerra, Montilla, Espejo, Rambla, and Alicant, in all which places it was introduced from Malaga; — follow his recitals respecting the epidemic of Carthagena in 1804, showing the transmission of the infection to Vera, by the wife and daughter of an officer who arrived at the latter place during the prevalence of the pestilence in the former, and who were taken ill soon after their arrival at Vera; the relations of them, the inhabitants of the same house, and those of adjoining houses, being successively infected; — peruse other facts of a similar nature adduced by this physician, and compare them with those which have occurred in Andalusia and elsewhere, and it will be impossible for the candid mind to resist the conclusion, that this malady is eminently contagious, inasmuch as it rests upon evidence the most conclusive that can be offered; and upon facts as positive and incontestable as historical facts can be."

107. Don J. A. FERRARI, physician in Xeres, in his account of this pestilence as he observed it in that city, has offered some very judicious observations and recorded several important facts respecting the topics now under consideration. "Xeres," he states, "is situated at an elevation of about sixty feet above the level of the sea. It experienced the yellow fever in the years 1800, 1804, 1819, 1820, and 1821. There are no morasses, marshes, or other sources of insalubrity within its boundaries." Whence then did this distemper proceed in those years? If it is proved that heat alone, however excessive, cannot produce it; and if this city is free from those local causes to which it has been imputed by the anti-contagionists, no other source or cause of it proper to this city having been shown to exist, whence did it arise? It is satisfactorily proved that, in all these years, the distemper existed, previously to its appearance in Xeres, in Cadiz, Malaga, San Fernando, and Puerto Santa Maria: and Dr. FERRARI shows that Xeres was infected from these places. In order to decide the questions of importation and contagion, he remarks, "it will be necessary to prove, in the first place, the arrival of some infected person in some particular quarter, and this is precisely what I shall endeavour to demonstrate from the facts which took place in this city, during the five epidemics which have been experienced in it since 1800, and which have fallen under my observation. In all these the mode of invasion has been the same. The malady had appeared in some of those towns, from which the infected person, who introduced the contagion into Xeres, had removed; as fully proved by the Municipal Board of Health in this city (the evidence and documents to this effect being lodged in the library of the board); and it has uniformly happened that the fever began in that quarter only where such person had lodged." "At the time of its appearance, or before its progress had extended, the malady existed only in the quarter in which it was first seen. Confining itself to that for some days, its progress slowly increased, following the direction of the street in which it first appeared; and of the houses adjoining the first infected. When it had spread through the city its propagation increased in proportion to the great number of communications which the increase of sick occasioned; and during all these periods, it was uniformly observed, that the disease began with units, proceeded by tens, and concluded by hundreds. When we consider," he adds, "that the distemper has always appeared in the sea-coast towns having intercourse with the West Indies, and extended itself to the adjoining towns and villages having had a communication with these, and not in those which have no such intercourse, or with which all communication has been cut off; nor with those in the centre of the peninsula, nor in any other save coast towns, although the latter may be less exposed to heat than the former; if it has been observed that its prevalence in Xeres took place only at the period when its importation could be traced; that during the time when the intercourse was less and the navigation less common, the disease was also less frequent; and if the patient suffers the distemper only once, as in the case of the small-pox, can we doubt of its importation and contagion."

108. Dr. FERRARI thus states the results of his observation: — "1st. That the cause of pestilential yellow fever is a poisonous miasma of a peculiar kind.—2d. That this contagious poison is the effect of the union of certain causes, developed by a high range of temperature.—3d. That the high temperature is only a necessary condition, but not the exciting cause.—4th. That as, in this city (Xeres) there does not exist, nor has ever existed, that union of circumstances necessary for its production, this distemper is not spontaneous, but has been imported as often as it has been experienced.—5th. That, from its mode of invasion, communication, and propagation in this city, we are necessarily led to consider it contagious:—and 6th. That, although it is certain that contagion and not heat alone may re-produce this pestilence, the re-production is neither so frequent nor so easy as is supposed."

109. This pestilence appeared in Barcelona in 1821, and extended to several places in the vicinity, and a commission was sent out by the French government, consisting of four eminent physicians, to inquire into its source and nature; and, in 1823, a very detailed account of it was published by the commission, forming perhaps the best treatise extant on this distemper. This commission consisted of MM. BALLY, FRANCOIS, PARISET, and MAZET, the last of whom died at Barcelona. Barcelonetta first experienced the malady, although this suburb is remarkable for its cleanliness and dryness; and soon afterwards the port; these places having the most frequent intercourse with the shipping. About the end of April, 1821, many vessels left the Havannah and Vera Cruz, where this pestilence was then prevailing, for several destinations; a large number proceeding to Barcelona, where they arrived about the end of June and in July. During the voyage to Europe many of the sailors died with the black vomit; their clothes and bedding being generally preserved and brought in the vessels. Notwithstanding these occurrences, free communication became established between the port and the ships, and between the ships themselves. These facts, as well as the following, were furnished by the authorities in Barcelona to the commission, but were mostly verified by it in various ways. The ship, "Grand Turk," had conveyed a number of negroes from Africa to Cuba; these negroes suffered severely from malignant dysentery. Having landed them at the Havannah, she departed thence for Barcelona and arrived in sixty-one days; having lost several of her crew by yellow fever on the passage. Soon after her arrival the captain received on board his wife, children, and a servant. The whole of this family were very soon afterwards taken ill and died at Barcelonetta. The mate also entertained on board of this vessel, his wife and his wife's sister and brother. Twenty-four hours afterwards his wife's sister and brother were attacked with fever and both died with black vomit; several other persons were also seized after visiting this vessel. Now the commission assert that they went on board this vessel and heard these facts stated by the captain and mate; and they, moreover, furnish further details of the infection conveyed in other vessels which arrived either about the same time as this or soon afterwards, and communicated to persons holding intercourse with them; and of the various circumstances which occurred in connection with the appearance of the pestilence in the city, all tending to explain the rapid extension of it, and the very inefficient measures taken to restrain its progress. It is impossible for me to advert to the numerous facts and circumstances bearing on the topics under discussion adduced by this commission. They may be perused in detail in their able work. From these they contend, 1st. That the pestilence which desolated Barcelona and several places in the vicinity in 1821, is the same distemper as the malignant yellow fever of the West Indies, and as the epidemics which have desolated the south of Spain at various periods since 1800.—2d. This pestilence is eminently contagious.—3d. That it was imported into Barcelona by the vessels which left the Havannah on the 28th of April, 1821, and soon afterwards.—4th. That the germs of this distemper conveyed by these vessels reside either in those actually sick of it, or in their clothes and bedding or other effects similarly contaminated, or in the air respired in these vessels by those visiting them.

110. Now these facts have surely either been unknown to, or, if known, entirely suppressed by, Dr. O'HALLORAN, who has professed to give an account of the Barcelona epidemic, and who has espoused the doctrine of local origin and non-infection. This writer states that persons sickened of the pestilence who observed the strictest seclusion; and that the attendants on the sick, the nurses in the hospitals, and the washers of clothes and bedding "generally escaped the impression of the malady." Notwithstanding this most unblushing assertion, the facts, as verified by official documents and by medical men of high character, are of a most opposite description; namely, that very few of the nurses and attendants on the sick escaped; that next to these confessors and priests in attendance on the sick were most frequently attacked; and next to them medical men. Thus the Capuchins were constantly engaged in assisting and confessing the sick, and their whole number, sixty-three, were infected and twenty died; and, so far from his assertion being correct as to the failure of seclusion, I may state that the evidence of its success is the most complete. The following convents,—the Capuchins, Los Angelos, Santa Theresa, San Juan de Jerusalem, the Hieronymites, and the Carmelites—observed the strictest seclusion, and not one of them had a single inmate infected; whilst all the other convents which communicated with the city had the greater number of the sisters attacked. Thus the Magdalen, consisting of fifteen sisters, lost ten, all having been infected, The sisters of Jerusalem, consisting of twenty-eight, had eleven deaths, and the others in nearly the same proportions. The French commission state that, at least twenty-two physicians and surgeons died at Barcelona of the pestilence, besides medical pupils, assistants, and apothecaries. In the military hospital almost none of the assistants to the physicians and surgeons escaped the disease, and many of them died. One of the members of the commission stated, that the great mortality among the medical men at Barcelona was an illustration of what he had witnessed during the epidemic yellow fever of St. Domingo in 1802, which carried off, in eighteen months, 206 physicians and officers of health.

111. In consequence of a decree of the Cortes of the 13th of December, 1821, requiring the authorities of Cadiz, Malaga, Barcelona, and the principal cities which suffered from the hæmagastric pestilence to consult the scientific bodies and the most celebrated physicians regarding the existence of contagion, medical juntas were formed in these cities and several other places; and all these convocations decided that this distemper is unquestionably contagious; that it is exotic and imported; and that the best means of preserving the country from its ravages is the establishment of regulations which may prevent the entrance of the pestilential infection.

112. It is of the utmost importance to the community, as well in temperate countries as in tropical regions, that the subject so long agitated, as to the nature of this pestilence, should be put to rest. The questions, as to the origin and diffusion of it,

have been explained in so different and even so opposite a manner during the early part of this century, and discussed so frequently and so variously — in a calm and philosophic temper by a few, with intemperance and an incoherent want of argument by many, with manifest ignorance of the subject and even of the language in which they wrote, by not a few — that they have been received as matters of the utmost doubt and uncertainty by those who have mere authority only to guide them to a just conclusion, without having suffered that experience and toiled in that field, which might have enabled them to judge for themselves. Much that has been written upon the subjects embraced by the questions at issue has tended to mystify, rather than to enlighten; to involve in utter confusion when attempting to explain what was already clear and unmistakeable; and to gloss with a false science what was manifest to common sense. Let the writings of the apostles of non-infection, especially as regards this distemper, be adverted to, and the mode in which they handle a very simple question be considered. In our simplicity we believe that, when one subject becomes infected with small-pox, or measles, or scarlet fever a short time after having been near to one or more persons already affected by either of these maladies, the infection has been communicated by these persons, whether the disease in question be epidemic at the time or not; and that, when persons who have recently experienced either of those maladies, or when the clothes of some one who has recently died of it, have been conveyed into places where the disease did not then exist, but where it soon afterwards broke out and prevailed, the infection of that particular malady was actually introduced. Now, observing these occurrences so frequently as to become familiar in respect of these distempers, and knowing that occurrences identical with these in every particular have taken place in regard to this pestilence, can we be so blinded by a false doctrine or by prejudice as not to infer, that the latter belongs to the same category as the former, — that the one is infectious as well as the other; more especially when, like them, it attacks the same frame only once, as long since stated by many observers, and now satisfactorily determined and admitted? But the enlightened observers of what is going on in the "bowels of the earth," consider this view of a scientific subject too common-place for their credence, and see it otherwise; and, in one sense of the word, although not in that which they would attach to it, much more profoundly. They either avoid allusion to this mode of communication altogether, or endeavour to explain it conformably with what they would term scientific views; and in place of what is based on incontrovertible evidence — upon what is palpable and unmistakeable — they substitute hypothesis and mystery, and adduce vague and unintelligible explanations to veil what is manifest, and to prevent the adoption of measures which alone can protect the lives of thousands, however they may for a time affect the pecuniary interests of the few — of the speculator and the capitalist, the modern curses of the general community. With no other object than the promulgation of truth, the surest basis of national prosperity as it is of all human science, I proceed to notice the last appearance of this pestilence in Gibraltar, respecting which the closest inquiries have been instituted both by a board of British officers and by a commission of physicians sent by the French government; and I shall adduce nothing but what has been satisfactorily proved by the most irrefragable evidence.

113. By the official returns there arrived at Gibraltar between the 1st of June and 1st of September, 1828, several vessels from Cuba and ports of Spanish South America, on board which at least ten deaths occurred during the passage. The ships more especially suspected were the Meta, the Hyperion, and the Dygden. They had come direct from Cuba and the Havannah; having been from forty-six to fifty-four days on the passage. Shortly before leaving the Havannah, where this pestilence was then raging, the Dygden lost four or five of her crew by the distemper; and, at least one of the men engaged to supply their places came directly from the hospital where he had laboured under this malady. During her passage to Gibraltar of forty-six days, nine persons were ill and two died. This ve-sel was put in quarantine; but the quarantine appears not to have been rigidly enforced; for during its continuance she was visited by smugglers; and at its termination, if not before, dirty clothes were landed to be washed; and two sailors were admitted into the Civil Hospital from this vessel, evidently ill of this distemper, although it was either not recognised, or not entered in the books of the hospital as such, by the medical attendants. From the smuggler and washerwoman to whom the foul clothes were sent, and from their families, the disease spread; and to them as well as to others who held communication with the importers of infection, it was traced much more correctly than it could be possible to trace the early progress of an epidemic of small-pox or scarlet fever, the infectious nature of which is undisputed.

114. It was satisfactorily proved to the boards of inquiry, and to the French commission as shown by their reports, that in addition to these facts, the mate of the ship was ill whilst in quarantine, and not reported to the inspector, — that one of the men who went on board to assist in navigating her to Cadiz was taken ill a few days afterwards, — that the clothes of the men who died on board this ship were sold to sailors who landed from her about the 6th of August whilst at Gibraltar, — that the sister of a sailor who landed from this vessel, and who had had the black-vomit fever in the Havannah immediately before he embarked from that place for Gibraltar, received a bag of foul clothes belonging to that sailor, and fell sick on the 20th of August, — that the health guard, Teste, who was placed on board this ship on the 27th of July, declared to several persons that she brought the yellow fever to this garrison, — that the sister of this health guard who, on the 11th of August, assisted to wash his clothes which he brought from this ship, fell sick on the 21st, — that the first persons attacked were the connexions of sailors and health guards, and persons who had recently been on board ships, and washerwomen; and that the ship Dygden was admitted to Pratique on the 6th of August, and the first case of the pestilence occurred on the 12th of the same month. It cannot be disputed that, when the sailors of this ship landed at Gibraltar with the clothes of the men who died of this distemper on board her, all the

collateral circumstances favourable to the propagation of it were present, namely, the sultry calm of a southern autumn; the peculiarly sheltered, unagitated, and humid state of the atmosphere at this season; the steady high range of the thermometer, and the abundance of subjects liable to receive infection from not having experienced the protecting influence of a previous attack. From the above evidence, from the circumstance of this fever being identical with the black-vomit fever of the West Indies, and with the epidemic fever, which have committed such ravages in this garrison and in the south of Spain, at different periods; from the fact that it is essentially different from every fever indigenous in any part of Europe, in its mode of attack, its symptoms, its duration, its consequences, and its anatomical characters; and, above all, from its affecting the same individual only once during life, it was rationally inferred that this malady was imported, and was not of local origin.

115. These inferences were further supported by the considerations,—1st. That not one case of fever identical with this pestilence had occurred in Gibraltar within the thirteen years preceding 1828, excepting four, which occurred in lightermen and Jews who had been in the habit of having intercourse with West India ships; although it is presumable that during that period all the physical causes inherent in the place and capable of generating disease, had been in as full action as at the breaking out of the epidemic; and although the population was more dense, and the houses less commodious during these years than in 1828, as proved by undoubted evidence. — 2d. That there was no evidence to show that there is any source of malaria within the Gibraltar territory, or that the effluvia arising from drains, even when they were most offensive, had any share in producing the distemper. The general conclusion, that this pestilence was imported into Gibraltar in 1828, and that it was afterwards propagated by direct communication, and by means of the clothes of persons affected by it, is conformable with facts observed in numerous other places, and with the results of enlightened observation and rational reflection—with the dictates of good common sense.

116. Dr. Jackson, in his work on this pestilence, especially as it appeared in the south of Spain in 1829, evidently considers, and in this respect errs with many others in thus considering, it identical with the endemic of the West Indies, and differing merely in its epidemic form—that it is the endemic heightened in degree, and rendered more prevalent owing to the intensity and diffusion of the terrestrial cause. It is painful to observe how injuriously this impression has acted on his mind whilst describing the true pestilential disease; for in that description he has mixed up many of his recollections of the West Indian endemic, and has wandered into lengthy lucubrations as to the type of the malady, and as to the influence of temperament in modifying its form, and has furnished the most undoubted internal evidence that he entertained no distinct views of the distemper, inasmuch as the whole is laboured, and in many places quite unintelligible. He remarks that "there is not one practitioner in one hundred who has resided for years in the West Indies, who believes that the concentrated endemic of that country, usually called the yellow fever, is a disease which possesses the power of propagating itself from person to person within the tropics." Certainly there is not. It is well known that all the writers on West India diseases during the last and present centuries admit this, but many of them — nay, the majority — also admit, what is the fact, that the severe endemic of that climate is not this pestilence; that the former is liable to be mistaken for the latter; and that both are often confounded together, although they are as distinct, indeed more distinct from each other, than measles and small pox. And in this Dr. Jackson errs with the minority, using at the same time terms which involve a theory, or mean nothing. Thus his "concentrated endemic" must either mean the more malignant form of remittent, which I have described, from frequent observation of it in warm climates, in the *art.* Fever, by the name of *malignant remittent*, and which I know well is neither infectious, nor the pestilence now under consideration, the differences between which have been long since pointed out by many very intelligent and experienced observers (see §§ 39. 121, *et seq.*).

117. Those who rightly contend for the infectious nature of this pestilence, view it as entirely distinct from the endemic and sporadic malady or remittent which resembles it, in some respects, as shown above (§ 39.). The non-infectionists, on the other hand, consider both diseases to be the same, the endemic or sporadic malady being, as they believe, heightened in degree under peculiar circumstances of the soil and situation, and of the atmosphere. They contend that these circumstances are sufficient to account for the phenomena observed in the epidemic or true pestilential disease without calling in the aid of infection. As the infectionists themselves admit the non-infectious nature of the endemic or sporadic fever which occurs in warmer climates, and which often appears in more temperate countries, during hot seasons, and assumes many of the characters of hæmagastric pestilence, the problems to be solved are, 1st. Is the latter distemper also non-infectious? 2d. As it is admitted that the former arises from terrestrial emanations or malaria, during high ranges of temperature and a humid state of the atmosphere, altogether independently of infection, does the latter distemper also acknowledge only the same sources, when they are rendered more intense?

118. What has already been adduced may appear to the unprejudiced sufficient to solve the above problems. Phenomena, circumstances, and facts cannot be annihilated by special pleadings, by confident assertions without proofs, and by vague hypotheses; and when we find that these have been chiefly confided in by the non-infectionists, and that they have confounded together two diseases possessing very distinct and altogether different characters, and, in their various pleadings, have imputed to one malady that which does not belong to it, because it appertains to the other, are we not compelled to believe either in the innocence of their ignorance, or in the guilt of their sophistry and unfairness? I shall leave the reader to adopt either alternative he pleases after perusing the following coquettings with infection by the greatest authority which this party can boast of, desiring only that the postulates, and the terms either of "no-meaning," or involving some crude hypothesis, may not be overlooked. Dr. Jackson ruminates as follows: — "The general atmosphere

of an epidemic circle is charged with a material of an unknown quality, distinctly offensive to health and animal life. The epidemic influence is general throughout a given district, more concentrated at some points of the district than others, from causes totally unknown to us, or only partially known. The atmosphere in the apartments of the epidemic sick, particularly if these apartments be crowded and ill-ventilated, may be supposed to be charged with this offensive material in a comparatively higher proportion than the common atmosphere, inasmuch as it has there less opportunity of being diffused. That, however, is only supposition; the following is fact: — *Persons of every habit, but more especially persons of susceptible habit, who enter into the apartments of those who are ill of the epidemic fever, rarely fail to experience unpleasant sensations at stomach, viz. distension and irksomeness; not infrequently uneasiness in the bowels; suspension or change in the natural functions; headache, heat, pain of the eyes, thirst, white tongue, disturbed sleep, and dreaming, amounting to reverie.* These beginnings of the morbid act are local; and as such they are for the most part removable by the prompt application of remedies that act locally, that is, by emetics, purgatives, or others, which produce decided changes in the secreting surfaces of the alimentary canal." "It is not said, that the impressions which produced indisposition on these occasions were impressions from the cause of yellow fever; it is evident, that the general atmosphere was epidemic; and it was probable that the atmosphere of the sick ward was so in a higher degree than elsewhere; or, if not so, that the diseased act was there suffered to explode with more facility, in consequence of the diminished coercive energy of the atmosphere which filled the sick apartments" (p. 49.).

119. I have copied the above verbatim; the postulates and nonsequiturs will be readily recognised without much logical aid. If the passage which I have put in italics is not a convincing proof of infection, especially when recorded so innocently, so unconsciously, by the arch non-infectionist, I know not what else can be considered as such. But wherefore should Dr. JACKSON say as above, that "emetics, purgatives, or others which produce decided changes in the secreting surfaces," act only locally? His experience surely should have proved the contrary. The reader will further perceive the "no-meaning," or absurdity, into which he lapses at the conclusion, when he attempts to escape from the very obvious, the palpable effects admitted by himself to be produced by the emanations from the sick. But he goes on further to admit as follows: — "The yellow fever, during the reign of epidemic influence, often strikes like a pestilence by the mere concourse of people in a close place; and if a mass of sick persons be collected into an hospital during the epidemic season, the common emanations from the sick bodies, whether saturated with contagious particles or not, often act offensively on those who enter the circle, and often appear to be the cause of the explosion of a disease which, without such accessory or changed condition of the medium in which men live, would have probably remained dormant for a time, and perhaps for ever. The instances of persons who have lived in apparent good health in simple epidemic atmospheres, and who have become sick soon after they entered into the circle of a crowded assembly, or the crowded wards of an hospital of sick, are numerous, and so well marked, that they stagger, on a superficial view, the opinion here contended for, of the non-contagious nature of the yellow fever." (p. 44.) To be sure they do, and being admitted by Dr. JACKSON they become evidences of infection as strong as "proofs from holy writ." But the superficial view, which he here deprecates, may nevertheless be the just one; at all events, I leave the more profound doctrine of the fons et origo mali e profundis, which he considers the truly scientific and credible one, for the adoption of those who,

> — "by the glare of false science betrayed,
> That leads to bewilder, and dazzles to blind,"

can see no truth in that which is a topic of general belief, which has good common sense to recommend it, and which is based on established facts, and supported by numerous collateral evidences and analogies.

120. I have already, and perhaps sufficiently, adverted to the circumstances of the great majority, if, indeed, not all of those who believe in the non-contagious nature of the hæmagastric pestilence, having confounded this distemper and the more malignant forms of remittent or endemic fever with each other (§§ 121—123.), and of the infectionists having considered that this pestilence is distinct from the latter; that it is infectious, but that the endemic is non-infectious, and of local origin; and that, whilst the same person cannot be infected by the former oftener than once, he may be attacked by the latter twice, or even oftener, especially under circumstances which will appear in the sequel. To these topics it is necessary more particularly to advert.

121. *d. That this pestilence is not identical with the endemic or remittent yellow fever of Africa and America*, I can assert, from my own observation and the testimony of the most experienced writers. The results of my observations are certainly in accordance with the evidences furnished by Mr. BOYLE, and several of his contemporaries in the British settlements in Western Africa *, in so far, at least, as that the former distemper is distinct from the endemic fevers of Sierra Leone and the west coast of Africa. The hæmagastric pestilence appeared at Sierra Leone in 1823 and 1829, presenting identical characters in its invasion, progress, and termination with those observed in the West Indies, North America, and the south of Spain; and although it was most fatal among the crews of vessels, and those recently arrived, yet it carried off many of the old residents and coloured population and of those who had undergone the season-

* Misstatements having appeared, although of slight consequence, respecting the author's visit to Western Africa, he thinks it due to himself explicitly to state, that he never had the honour or advantage of being in any public service, or in any service whatever; that his passages to and from Africa were altogether at his own private cost, and were dearly paid for before embarking in both instances; and that his travels between the several British settlements and other places, as well as his residence in the former, were also at his own charge and expense. He may further state, that having obtained his degree in medicine after a continued residence of seven years at the university, he has exercised his profession in no other capacity than that of physician; and that he employed the time which intervened between that of leaving the university, and that at which he joined the College of Physicians of London, and commenced practice in the metropolis, in travelling, unaided and unpatronised, in various countries, with the view of obtaining medical knowledge.

ing and remittent of the country, and who were considered safe from any return of these. The above writer and Dr. W. Barry agree in stating this to have been "a fever, not entirely new, but extremely rare" in that country; and that it appeared during the healthy season, when the endemic remittent fever is not prevalent. That this pestilence was infectious at Sierra Leone is shown by the conviction to this effect of the educated and respectable part of the population; by the history of it in the Bann and Eden ships of war, and in many other vessels, and by its extension from the Bann to the military in the Isle of Ascension, and to other ships. There is generally much difficulty in distinguishing the malignant remittent of Africa from this pestilence, owing to the imperfect remissions of the former, and to the presence, at an advanced stage of fatal cases, of many of the symptoms characterising the early and rapid progress of the latter; and hence the epidemic is generally advanced, or has extended to many, before its nature is recognised. Opinions as to the origin of these two epidemics in Sierra Leone were by no means consistent with each other. The disease was said to have commenced amongst the inland native population, and to have extended to this town and the shipping, as well as to places to the northward of it on the coast. There can be no doubt of the fact of the prevalence of this distemper among the natives of those places before it appeared at Sierra Leone, but it was milder, less prevalent, and less fatal among them, than among Europeans. On the other hand, the grand jury of this port state in their presentment, as respects the epidemic of 1829, "that they attribute the present unhealthy state of Freetown to the practice of landing slaves from the prizes in the centre of the town, where they are necessitated to remain under the disease with which they are afflicted in a small yard, not more than 120 yards square."

122. It would be more tedious than instructive for me to adduce even a part of the evidence now before me of the distinct nature of this pestilence from the endemic remittent yellow fever of warm climates. Every writer, from Lining to the present time, who has espoused the infectious nature of the former, and all those whose opinions I have noticed above, both British and Foreign, agree in admitting the distinction, whilst many of the non-infectionists either cannot recognise a difference, or do not choose to do so, as it militates against their doctrine. I shall only adduce the opinion of M. Guyon, one of the chief physicians attached to the French army which occupied Cadiz in 1827 and 1828; because he states, that he formerly believed in the identity of this pestilence with the malignant form of remittent fever; but that his observation and experience in Spain had convinced him that he was wrong. He remarks: "Not that, with all my belief as to these diseases being identical, I had failed to perceive well-marked differences between the one and the other; but it must be owned, such is the influence of an opinion already formed, that, of the facts connected with it, we see only the side favourable to that opinion. The differences between these two maladies are many;" and he forthwith proceeds to point them out with much accuracy. Much of the misconception which formerly existed respecting these maladies, was owing to the unfortunate names given to them, especially to the application of the term yellow fever, which, as will be seen from what has been adduced from various writers, was generally applied to this pestilence, although the yellowness of the surface was more remarkable in the severe endemic remittents, not only of Africa and America, but also of the south of Spain and shores of the Mediterranean.

123. The remittents, whether bilious, gastric, malignant, &c. (see Fever, *Remittent*), with which this pestilence has been confounded, are diseases depending upon the nature of the locality — upon exhalations from the earth's surface and its productions, varying however, in character and severity, with the temperature, humidity, and stillness of the atmosphere, and most probably also with the electrical states. But this pestilence is produced in all cases by an animal poison—by an infectious miasm generated by, and emanating from, the affected; and contaminating the immediately surrounding air, and various animal or other substances capable of imbibing it, and of imparting it to the atmosphere, but requiring certain states of the air as regards temperature, humidity, and stillness for its dissemination; and thus, as it will be more fully seen from what has been stated respecting *remittents*, and from what has been already adduced as to this pestilence, the one proceeds from a distinct and specific cause, the other arises from terrestrial exhalations, of various grades of concentration, producing coordinate effects. This pestilence, wherever it appears, presents certain prominent features, like small-pox, or scarlet fever, however it may vary like them in severity and in certain subordinate characters. If it proceed from terrestrial exhalations, as the non-infectionists suppose, how is it that it does not appear in many situations where these exhalations are the most indisputably produced, and are as remarkably favoured by a humid, warm, and still atmosphere, as in those places where it has occurred the most frequently? And wherefore is it not observed within the tropics, in the eastern hemisphere, where the most malignant as well as the most mild forms of remittent fever is prevalent at some season or other?

124. Dr. Wilson, who observed this pestilence in the West Indies, states that 117 cases occurred within a few weeks, and that "though they varied much in violence, and in many other points, they were uniformly continued, and that nothing like remission could be detected in any of them." (p. 180.) — Jackson, Bancroft, Fergusson, and others, however, believe in obscure remissions, confounding this malady with remittent fevers; and hence arguing most illogically against the protection from it afforded by a previous attack. They further contend that reasons for not detecting remissions are to be found in the "violence of cerebral action and speedy gangrene of the stomach;" or in the circumstance of the functions having been overwhelmed and extinguished. Now cerebral action is often not violent. The power of the brain is rather depressed than excited; and it is well known, that the stomach is not found gangrenous in those cases, in which the examination of the body after death is not too long delayed. Besides, in a large proportion of cases there is neither overwhelming nor extinction of the functions, but a slight grade of febrile actions in many instances followed by quick recovery; and yet, even in these, no remissions

occur. But this topic requires no further illustration. Another important circumstance evincing the marked distinction between this pestilence and the worst forms of endemic fever is the fact, that recovery from the former is generally rapid and complete, without the visceral enlargements and obstructions so frequently observed to follow the latter. The morbid appearances after death are also different, for, whilst the liver and spleen are generally more or less congested, enlarged, and softened by the endemic remittent, these organs are even paler and less vascular than natural, although often somewhat softened in common with the rest of the textures, in the hæmagastric pestilence.*

125. *e. That this distemper attacks the same individual only once*, a previous infection protecting the system more decidedly from a future seizure than even small-pox or scarlet fever from a second attack of these maladies, has been remarked by every experienced writer since LINING, and is an additional proof of the two propositions which I have endeavoured to establish, namely, 1st. That this malady is propagated, like them, by an infectious emanation or animal poison;—2d. That it is different from the more malignant forms of remittent or endemic fever which is produced by terrestrial exhalations, which is non-infectious, and which attacks the same individual oftener than once, especially if he have had a change of climate after the first attack. Dr. JAMES CLARK, who had great experience of this malady in the West Indies during the latter part of the last century, and who has carefully distinguished it from the remittents of these islands, states, "that those who recovered of this fever were never attacked a second time, at least no instance occurred of it in our island, nor in any of the other islands, as I have been informed." (p. 19) The truth is, that no recent writer has denied this fact, excepting those who have confounded this pestilence with remittent fever; and who, having seen repeated attacks of this latter malady in the same person, and believing both maladies to be identical with each other, have fallen into the sophism of believing that what was true of the one was also true of the other. The protection afforded by a first attack, although recognised by several writers before Sir W. PYM, was never duly insisted upon and turned to a beneficial account, until his services were so usefully exerted in the early epidemics of Gibraltar. About the same time that he was acting upon this knowledge to the advantage of many thousands, the Spanish physicians also became aware of the fact, from observing that all those who had suffered from the distemper during former epidemics were not infected by it subsequently. Notwithstanding the numerous evidences of this important fact, adduced both in Europe and America, and by the French medical commissions, still the truth of it was disputed by the non-infectionists; for they believed, and believed truly, that the admission of it would be the surrender of one of the strongest positions which protected their doctrine. But the determination of this fact so as to place it beyond the cavils of a party, and the special pleadings of the prejudiced, was undertaken by Sir W. PYM at Gibraltar; and notwithstanding the opposition of writers, already passed into oblivion, is now established as one of the most undoubted truths in medicine. He acted upon it in Gibraltar in 1810, and was thereby enabled to cut short at once an incipient epidemic. "He separated the first sick and the suspected from the healthy population, using, as his instruments of separation, those who had acquired the necessary immunity in some former epidemic. This proceeding now forms the basis of the sanatory law in Spain, and has been successfully repeated in Barbadoes in 1821 by Mr. GREEN." (Sir D. BARRY, *loc. cit.* p. 97.)

126. *f.* Much, indeed the greatest part, of the numerous calamities of which this pestilence has been the cause, has arisen from the manner in which the crews of ships have been disposed of in respect both of the appearance of it in ships whilst at sea, and of the communications of the crews and of their personal effects with the ports to which they are destined. Of the latter of these topics sufficient notice will be taken hereafter; but it will be necessary to the full consideration of the infectious nature of this distemper, that some notice should be taken *of its appearance in ships of war, in transports, and in other vessels.* I have perused most of the accounts of the outbreaks of this malady on board of ships to which references are made in the BIBLIOGRAPHY to this article; and I have been particularly struck, not only by the very imperfect manner in which so very important a topic as the origin of the distemper on ship-board has been considered in most instances, but even by the neglect of it altogether, the reader being either left quite in the dark and to his own inferences, or he has intruded upon him various suppositions or false facts in the shape of foul ballast, bilge-water, chips, shavings, &c., which have been considered quite sufficient to account for the accumulated horrors which have been witnessed. Amidst the numerous distressing details, through which the reader who wishes to investigate the subject will be doomed to labour,

* Dr. IMRAY states that, in the epidemic of this pestilence which he observed in Dominica in 1838, the yellow hue extended over the body, but was deepest in the neck, shoulders, and breast, with here and there dark irregularly shaped spots and blotches, these parts and the scrotum assuming, immediately after the extinction of life, a greenish colour and livid appearance, while the yellow tinge over the whole body was deepened. Black vomit was not so constant as the yellowness of the surface; but it occurred in the majority of the fatal cases. "On examination after death, even when black vomit had not occurred, the stomach was always found to contain that fluid; and in all probability, in most of those cases that ended very rapidly with but little gastric disturbance, dissection would have revealed the presence of that fluid in the stomach. This deadly symptom usually occurred on the third or fourth, sometimes on the second day." When the dark vomit came in contact with the patient's linen or sheets, it left a dark indelible stain. In the endemic remittent of the island, (he adds,) "yellowness of the skin not unfrequently takes place, but is unaccompanied with that peculiar lividity of the neck, shoulders, and breast," which is so frequent in this pestilence; black vomit occurring very rarely in the endemic remittent.

To the above distinctions, Dr. IMRAY adds that this latter disease is seldom so sudden in its attack as the former, is usually ushered in by chills or rigors, and is marked throughout by distinct remissions and exacerbations; but in this pestilence, any sensation of cold was seldom experienced, either at the commencement of the attack or subsequently; and no remission was ever observed until the period of deceitful calm, when all pain and febrile excitement subsided. "This state, however, was never followed by an exacerbation, but seemed to proceed from loss of excitability and exhaustion of the vital energies." The above is a very correct and precise diagnosis of the two maladies which has been so ignorantly, if not dishonestly, confounded with one another by so many writers against the infectious nature of the hæmagastric distemper.

he will find very few who impute this distemper to any other source than to the above, or to some other cause equally absurd, and quite as inadequate as they are to explain the results. Although the ships which have been the subjects of these dreadful visitations have proceeded very shortly before from ports in which this pestilence was prevailing, or have recently received persons on board from, or otherwise communicated with, these ports, or with other vessels containing cases of the malady, or even although they have been actually lying in the harbours of the towns where the pestilence was prevailing, still these writers could see nothing to account for the appearance of it on board the ships of which they had the medical care, than some one of the suppositious causes now mentioned, which, even if proved to exist altogether in their fullest force, are quite inadequate to the production of the effects, often too weakly or too lightly noticed. Let any one, who feels duly the responsibilities of the medical charactef, read the accounts so frequently furnished us by the chief actors in the scenes which they describe — the statements of black vomit or yellow fever having broke out; of the greatest part, or the whole, of the crew having been attacked, and of nearly the half having died — without any rational explanation of the occurrence being attempted, without any idea of or reference to infection being entertained, without any evidence to show the absence of infection, or that it had not been introduced; and, what is still more monstrous, without any satisfactory attempt, or even without any attempt at all, having been made to limit the mischief, or to prevent the extension of the infection to the healthy, — and having thus read the dry details of facts thus furnished him — facts barren as to the minds of most of the narrators, and of them only — let him then come to the conclusions if he can, that all has been correctly observed, and rightly inferred; and that measures of prevention have been sagely, or even at all adopted.

127. This pestilence appears in the crews of ships of war, or transports, or other vessels, and is readily recognised by the rapidity of the fatal result, by the black vomit, &c. The ships are at the time either in a port, or have recently left a port in which it was prevailing. One ship is provided with pig-iron ballast, and therefore, as it cannot be viewed as the cause, bilge-water, or chips, or shavings, below the limber-boards, which generally exist in all vessels, are most logically inferred to be the cause of the distemper. Another ship has shingle ballast, and lo! the source of mischief is discovered. A third has neither shingle, nor chips, nor shavings, nor even bilge-water to furnish an explanation, and as the idea of infection cannot for a moment be tolerated by the very scientific surgeon, he therefore arrives at the very transcendental conclusion, that the pestilence which has seized the whole crew, himself and assistant, and killed nearly half, is nothing else than the effects of a "*ligneous principle*" developed from wood by a high temperature! Whilst the men are dying like rotten sheep — in equal numbers and with equal rapidity with these not very sagacious animals — the commander is alarmed, all are amazed, explanations are required of the learned doctor, and in almost every case the reader will find that some one or other of the above causes is assigned by him. Infection suggests itself to common sense people, and probably to the commander; but the unfortunate surgeon's common sense is over-laid, is smothered, by vicious authority and worthless writings. Besides, he thinks infection a "vulgar error," and its recognition below the dignity of science; or, if it intrudes itself upon his mind as the pestilence progresses, he feels that he has already committed himself, and cannot retract without practically exposing his ignorance. He, therefore, sticks to his explanation, even acts upon it, and afterwards, perhaps, writes a book to prove his sincerity. All the while, as the imputed cause is supposed to have already produced all the bad effects that will ensue, either nothing is attempted to get rid of it; or, if any attempt be made, the measures connected with such attempt tend only to diffuse, or to concentrate the infectious poison, which either was not dreamt of, or not guarded against, nor in any way restrained nor counteracted. Indeed, on too many occasions the prevention of disease in the public service is considered beneath notice: it has formed no part of professional education; and when the information, which has been acquired chiefly with the view of passing an examination, has to be applied to great or pressing emergencies, the cure of cases as they rapidly occur is attempted by certain heroic remedies, whilst measures of prevention are either never thought of, or very imperfectly employed.

128. Now the reader may suppose that the above is an extravagant, an exaggerated statement of singular or rare occurrences, and of the notions which they have suggested to the very scientific observers. But let him peruse the voluminous writings on the subject, if he can command the patience or the temper necessary to the drudgery, and then let him decide. In some instances he will find it admitted, that no cause for the evil could be detected in the ships themselves, and that, therefore, there was no cause for the existence of the pestilence, — or in other words, that the most terrific effects were produced without agents. They will, however, think that I am now actually doing the celebrated persons who have thus distinguished themselves a gross injustice by this statement; but they are themselves the perpetrators of the act. In Dr. WILSON's book on this pestilence he will find sufficient evidence to this effect. This writer has favoured us not only with his own opinion, but also with the officical opinions of Dr. BANCROFT, Dr. ADOLPHUS, and Dr. MACNAMARA, as to the appearance of this pestilence on board of certain ships of war. Now, these physicians held the highest medical appointments in the West Indies; and as we ought to find the highest amount of medical knowledge in the highest places, their opinions deserve respect — at least until we know them; but unfortunately after that knowledge is acquired all respect vanishes in spite of the most anxious efforts to retain it. As the reader may be more fortunate in this respect, let him peruse the official reports of these physicians in Dr. WILSON's work (at p. 141 — 147.); and let him endeavour to give as much credit as the amount of his credulity may permit to this writer's doctrine of the "*ligneous origin*" of this pestilence; for he avers that, if this origin be not admitted, "we shall be under the necessity of contemplating and endeavouring to counteract

a disease, regarding the origin of which we know nothing; we must look upon this sweeping pestilence as an effect without a cause, excepting such a cause as that *which smote the fourteen thousand Israelites in their tents.*" One would have supposed that, after this apparent endeavour to discover a cause, some attempt would have been made to show that the malady did not arise from infection or contagion, either directly or indirectly introduced on the occasions in question, before the "*ligneous origin*," or "*principle*," or *product not arising from dry-rot*—this something proceeding from wood, but not recognised by the senses—this essence not seen, but believed in, nor detected chemically or otherwise—this ignis fatuus so alluring to the doctor, yet so destructive to his patients—could have become the object of a devoted faith, of a firmly rooted belief. But no such attempt is made, and although the ships of war were lying at Port Royal, Jamaica, when this pestilence first appeared in them; and although it is well known that it was more or less prevalent in this place, and in several of the ships in this port at the time, yet no notice is taken of the probability of infection having been conveyed on board the ships of war which were so terribly ravaged by it; and there does not appear that any attempt to prevent its introduction was made at any time. Indeed, on these occasions, as well as on most others, the adoption or non-adoption of measures of prevention rests with the commander of the vessel, or with the surgeon, under the sanction of the former; and where neither the one nor the other believes in infection no restraints are imposed. It would appear from the official reports of the high medical functionaries above named, that they did not believe in infection. It is well known that Dr. BANCROFT has written voluminously, but it may not be equally well known that he has written either candidly or truthfully, in disproof of infection. By the official reports on the ships of war at Port Royal just alluded to, neither he nor his coadjutors have done themselves much credit. They have most entirely and most signally damned the cause they wished, at least professed, to support. Dr. BANCROFT furnishes, "*proprio Marte*," the most damaging proofs—the most conclusive evidence that could be adduced against that very doctrine which he attempted to establish by means of too thick octavo volumes of misrepresentations and special pleadings. Dr. WILSON would have deserved the thanks of all candid minds for the publication of a report which entirely destroys the most vicious doctrine—the most destructive in its consequences to the community—that has blinded the understandings of weak men, had he not at the same time attempted to rear a structure equally injurious, and even more unstable and absurd than the one which he has so completely overturned. But let me advert more particularly to the case of the unfortunate ships of war which called forth the reports of the above great West India authorities.

129. It should be premised that the infection of this pestilence had lurked for several years or even longer in the most frequented sea-ports of the West Indies, as Port Royal, the Havannah, Vera Cruz, &c.; and as the inhabitants, especially those who have resided long in these places, have been once attacked and are no longer liable to be attacked again, it follows that comparatively few are predisposed to the affection, excepting strangers or young persons; the arrival of a number of the former, particularly of persons from Europe, being followed, whilst the infection remains in the place, by an increased prevalence of the distemper. Hence the arrival of ships from Europe—whether ships of war, transports, or traders, and of troops from a different climate, is often very soon followed by an outbreak of this pestilence among them, more especially if no measures are taken, as too generally has been the case, to prevent the introduction of the infection, or to sequestrate those first attacked. The Iphigenia ship of war, whilst in Port Royal harbour, became infected with this pestilence. At the desire of the admiral, Drs. BANCROFT, ADOLPHUS, and MACNAMARA proceeded to examine her, and reported her clean, dry, and sound in every respect. They admit that the malady prevailing in this ship was this pestilence; and that it could "only be produced by an external cause," as no cause could be detected by them in the vessel herself; but what this external cause might have been they appear to have been at a loss to imagine, for they summarily dismiss the idea of infection, without, however, adducing any evidence or argument against either the introduction or diffusion of the distemper by this cause. Whilst thus drivelling respecting the existence of "*an external cause*"—this suspected entity or non-entity—the following statement is made by this sage commission:—"We abstain, at this time, from offering any opinion as to the probable cause of the disorder [and this pestilence is only a *disorder* in Dr. BANCROFT's estimation—the reporter of the commission] in the Iphigenia; though we think it right to state, that we have not hitherto found evidence sufficient to authorise the belief, that her anchorages in the harbours of Curaçoa, off Puerto Cabello, or Port-au-Prince, within the last five months, at all contributed to produce the fever." Now, what is here aimed at? They assert there was no internal cause or source of mischief; that hence there must have been an external one; but that this external one was not derived from the harbours just mentioned: they therefore would seem to infer that it existed, or was derived, from the port where this ship was now lying. But Dr. ADOLPHUS comes to this conclusion, in a separate document. "I consider the fever (in the Iphigenia) to have been produced by increased temperature and other atmospheric causes;" and here he stops without a single word being added. This, therefore, we must consider as his "external cause." Dr. MACNAMARA next enlightens us with his "external cause," also in a separate document of most palpable absurdity. Here it is: "It is difficult to account for the generation of disease in a ship so well regulated, and in such a state of high discipline as the Iphigenia: and I am most positively and decidedly of opinion, that the disease, which has already committed such ravages on board that ship, is to be solely attributed to a particularly vitiated state of the atmosphere, the influence of which has been experienced along the whole of the American coast, from the northern bank of the Oroonoko to Boston in New England, and in the adjacent islands." How precisely this vitiation of the air, this arch assumption is limited! What countless crews of ships must have suffered,

what interminable wretchedness on ship-board, and on coast-board also, must have been produced by a "particularly vitiated" air, extending from the Oroonoko to Boston, inclusive of the West Indies, &c. How few could possibly have escaped destruction, seeing that the air which all within these extended bounds must have breathed, was in the "positive and decided opinion" of Dr. MACNAMARA in "a particularly vitiated state!" What a loss science has sustained in having had the particular vitiation in question, so decidedly and yet so precisely extended, left entirely unexplained, and its nature unascertained! But this deficiency may have been subsequently supplied, and the document supplying it may be buried in the rich repositories of the Medical Board and Somerset House. The reader has now got the opinion of the majority of the commission as to the mysterious "external cause" of this fever. What Dr. BANCROFT's opinion is does not appear. Probably his experience as to his former opinions makes him more reserved on this occasion, and he comes into the field fortified by the caution of an old soldier.

130. The crews of ships of war, transports, or traders, are rarely the subjects of fever in the West Indies, unless they are exposed to the infection of this pestilence in the ports where it is prevailing at the time, or have the infection introduced among them from these ports, or from infected vessels. They are rarely in that country exposed to the malaria proceeding from marshes or lagoons, unless when watering, or when allowed to remain on shore, and then they readily are attacked by remittent fever, especially if they have slept within the sphere of these sources of disease. The pestilential fever now under consideration has appeared on board many vessels whose crews have not been exposed to these sources, and not a few of these have been ships of war which were certainly not so exposed. Nevertheless, attempts have been made, although most fruitlessly, to show that the causes of the distemper have existed in the ships themselves; either the ballast, or the bilge-water, or the wood itself of which these vessels were built, having been imputed as the cause, without the least endeavour to prove any thing actually noxious proceeding from any one of these sources, or to demonstrate the generation of any gas from them, whereby the air could be vitiated. Ships of war are now, and have long been, provided with iron ballast and tanks, so that the chief source to which the non-infectionists imputed the distemper did not exist in them; and yet we find that many ships of war have had their crews nearly altogether carried off by it; and although the introduction of infection might have been presumed, owing to the remarkable probability of such an occurrence, these vessels either being at the very time in infected ports, or very recently having left such ports, or having communicated with infected vessels, yet no satisfactory inquiry was ever instituted by the surgeons of these vessels to determine the question as to the propagation of the malady from these sources; the only inquiry that was made being that respecting the conditions of these vessels as to cleanliness and discipline. The probability, or even the possibility, of infection was not dreamt of; indeed, many of those to whom the matter more especially appertained, would neither see nor admit infection under any circumstances, neither the word nor the meaning attached to it being comprised within the limits of their belief. Take for instance the following:—

131. The distemper existed at Port Royal, in Jamaica, both previously and subsequently to the arrival of the Rattlesnake ship of war there, in July 1824; this vessel being clean, sweet, well ventilated. Dr. WILSON, the surgeon of her, admits that he was himself the first who was attacked; and that he, as well as the purser, was seized "*from exposure to the cause on shore.*" Indeed, there can be no doubt of both of them having contracted the disease on shore, for Dr. WILSON admits this in no less than two places at p. 159. of his book, written to prove the "ligneous origin of the distemper." And there is as little doubt of their having introduced the infection on board this vessel, although he argues against the existence of infection, but without furnishing any proofs of his position; the efforts to infer the non-existence of this property obviously originating either in a desire to establish his own hypothesis, or in the consciousness of having neglected measures to prevent the diffusion of infection—a diffusion fatal to a large proportion of the crew. The following are facts which cannot be refuted.

132. First; this pestilence prevailed at Port Royal, more or less for several years, about this epoch, namely, from 1819 to 1826; but the doctrines of BANCROFT and other non-infectionists were exerting a most noxious influence over the minds of medical officers in the public services in the West Indies. Owing to this circumstance no measures were taken, with few or no exceptions among either the military or the naval forces, to prevent, to limit, or even to restrain, the spread of infection. The only restraints which were attempted, and these but few, were owing to the good sense of commanding officers. During this period the crews of many ships became infected with this pestilence at Port Royal; but the surgeons of these ships, with the exception of the surgeon of the Scout sloop of war, were blinded against infection, and had some favourite hypothesis to support.

133. Secondly; the Rattlesnake having thus arrived at Port Royal, where the distemper existed, communicated with that port; the officers who first went on shore were the first attacked by it; and nearly the whole of the crew were afterwards seized, at first gradually, but subsequently much more rapidly; for the ship having put to sea under a false impression as to the cause of the malady, and bad weather having come on, and occasioned the shutting of the gun-ports, &c., thereby preventing due ventilation, the distemper spread with greatly increased rapidity and fatality. These are the facts respecting this ship of war, and they cannot be gainsaid by any special pleader.

134. Thirdly; but in these fatal years, other ships of war arrived during the years 1824 and 1825 at Port Royal, and suffered in a similar manner to the Rattlesnake. The Isis ship of war arrived at this port in 1824, and this distemper appeared on board of her in October. She was ordered to the Gulf of Mexico, where the prevalence of north winds at this season reduces the temperature to about 65°, or even lower, and the disease subsided. This ship returned to Port

Royal in the following autumn, and the malady re-appeared in her, and was very destructive. In this year, the Lively, Pylades, and Ferret were half unmanned whilst lying in this port; and other ships were similarly infected. But the calamitous consequences of a general indisposition on the part of medical officers to admit the existence of infection were not limited to the naval service. The military medical officers, with the CORYPHÆUS of non-infection then at their head, were equally blinded to every perception of the property to the non-admission of which the lives of thousands were sacrificed. Stoney Hill in Jamaica is situated 1300 feet above the level of the sea, and would be healthy for troops if precautions against the introduction of infectious fever were duly instituted. The seventy-seventh regiment arrived in Jamaica in 1825, and was stationed here. This pestilence appeared among them, and no satisfactory means of preventing its spread having been taken, it attacked nearly all, and carried off a very large proportion. It should be moreover recollected that the greatest prevalence of the distemper on shore among the military, and amongst the inhabitants of Port Royal, who were not protected by a previous attack (for this protection and its influence should not be lost sight of in the argument), was in the very year and season of its most destructive prevalence also in ships arriving at this port.

135. The surgeon of the Scout sloop of war sent home documents proving the contagious nature of this distemper on board of this ship; and Dr. J. JOHNSON, whose belief in this property appears to have been very limited, or contingent as he terms it, states that he "had seen these documents, and can vouch for the highly contagious character of the fever." (*Med. and Chirurg. Rev.* vol. ii. p. 12.) Now, if admitted to have been contagious in the case of this ship, and likewise in the case of the Bann, as demonstrated by Sir W. BURNETT, the able and zealous head of the naval medical service, how comes the same identical malady to be non-contagious on board of other vessels, placed in similar circumstances to these, in which others it has been even more general and more fatal? Surely, if in about a dozen ships of war the same distemper appears after arriving at a certain seaport where that distemper exists, and if it be admitted by one from whom the admission is almost extorted, that it was actually contagious in one of these ships, it could not be less contagious on board of the other ships which had arrived at the same port, which had been infected from the same source, and in which it was even more fatal than in the one to which the contagion is conceded. This is a matter which concerns the lives, not only of the crews of ships, but also of regiments, of armies, and of the inhabitants of populous cities and towns; and yet it has been allowed up to the present day to be disposed of, and measures, or rather worse than no measures, have been permitted to be taken respecting it, in our numerous colonies and dependencies—in our fleets and in our armies—according to the visionary notions of the totally inexperienced, and of those altogether unacquainted with the nature and cause of the pestilence in question; or, what is still worse, to those who have formed erroneous notions respecting its source and properties. What can be the use of accumulated facts and of countless observations to prove that which requires no further proof, if they are not to furnish data, from which correct inferences are to be drawn for the benefit of the inexperienced, for the direction of the wrong-headed, and for the advantage of the general community, by those competent persons it is to be presumed to whom these facts and observations have been officially furnished? And possessing these data, should it not be required that such inferences shall be drawn by minds capable of weighing evidence and of devising rational expedients of protection, that these inferences might be made the basis of instructions for the institution of salutary measures for the guidance of the uninformed and the unthinking, and for the strict observance of the reckless and the vain theoriser, in order that hundreds of thousands of human lives may not be sacrificed to the Moloch of false doctrine, as they have been during a long series of years.

136. *g.* Let the occurrences at *Sierra Leone* in 1823 and 1829 be taken as a specimen of the mode of medical protection from pestilence in a colony most liable to outbreaks of it, although provided with a colonial surgeon, a deputy inspector of hospitals, and with other medical officers. This distemper has appeared at this place also in other years; but the colonial surgeons and deputy inspectors have written on the occurrences of these years, and books and reports have been the results of their Sisyphian toils. The governor of the colony, however, has thrown light upon a subject which they have confused and mystified; and has shown, as respects the epidemic of 1829, that it was imported into the colony, and that it was highly contagious both there and among the shipping. (*Narrat. of the Ashantee War, and Present State of Sierra Leone, &c.* By Major RICKETTS, Governor. 8vo. Lond. 1830.) The medical writers on those epidemics—for they cannot be called authorities as regards this malady, unless they be viewed as such against the doctrine which they toil so ineffectually to support—found that a distemper which they recognised, after a time, as altogether different from the endemic of the country, had come among them; but they were quite unprepared for the occurrence notwithstanding the records and recollections of former visitations. They appear at first to have mistaken the malady for the endemic of the country; and when their eyes were opened they were amazed and alarmed; and they acted as they have written, in a state of imbecile confusion and bewilderment. Their accounts are full of contradictions. Whilst they argue against infection, they, in the unconsciousness of helpless ignorance, furnish the most conclusive evidence of the existence of this property. They admit that the persons attacked first in the colony had visited a place in the vicinity two or three days previously where the pestilence was then raging, yet they deny the existence of infection, and issue notices to prevent the adoption of precautions against the spread of the distemper, at the very time when such precautions ought to have been taken under their directions. They admit the identity of the malady on shore with that on board of several ships in the roadstead, and of both with the pestilential yellow fever, and yet they contend that it was altogether non-infectious in the former, and infectious in the latter! Their admission of this property in the ships was

evidently extorted from them by undeniable facts, and the firm belief of every rational and unprejudiced mind; but no measures of protection were proposed by them.

137. The *source* of the distemper might have been readily ascertained in both these epidemics, if the inquiry had been instituted by competent, candid, and unprejudiced persons. Indeed, in their unfortunate endeavours to mystify the matter they sufficiently indicate the source, although without the precision and force which might have been imparted to it by positive evidence. Still the admissions of infection which escape their powers of concealment are perhaps the strongest proofs of the fact that could have been adduced. The infection having been introduced without having been recognised or suspected, until its mischievous effects had proceeded far, by those whose duty it was to watch for, to detect, and to guard against it, their secret yet manifest desire was to deny its existence, and to suppress, misrepresent, and distort occurrences and circumstances accordingly. Although persons belonging to the colony had visited places adjoining where the pestilence was raging at the time, had returned to the colony, and were immediately afterwards attacked and died, other cases of the disease following upon these admitted to have been the first; and although ships, more especially slave-ships with sickly cargoes of human beings, arrived at the colony just before and at the time of the outbreak of these epidemics, some of the writers on the subject contended that the distemper had arisen from malaria brought from a distance by the winds, and others concluded that it had travelled from the interior of Africa to the coast—a sufficient admission of infection; whilst the more observant of the residents believed in its introduction through one or other of the channels just indicated, or through both. There can be no doubt, however, that the distemper was conveyed in 1823 on board of the Bann ship of war, then at Sierra Leone, where it was prevailing both on shore and in the shipping, either from one of the slave-ships detained at Sierra Leone, or from a trading vessel at that place; that the crews of the Bann and of the San Raphael, a tender to and accompanying the former ship, were generally attacked, a very large proportion having been carried off on the voyage to the Island of Ascension, from Sierra Leone; that the pestilence was introduced by these ships into that island where every one was seized, and many died of it; that the Driver sloop of war arrived in perfect health at this island, where a very restricted communication took place between her and the Bann; and that three persons "were taken ill with the prevailing fever, two of whom were sent on shore, and one died on board; and the captain very properly put to sea and used every precaution; and with these three cases the disease ceased." (Sir W. BURNETT's *Official Report of Sickness, &c. in the Bann.*)

138. Whilst the pestilence was prevailing at Sierra Leone in 1829, the Eden and Champion ships of war left that colony for Fernando Po, and immediately upon their departure it appeared, and ravaged these vessels, all the medical officers, five in number, having been attacked, three having died. When the ships reached Fernando Po they had lost about half their crews. At this latter place communications took place between the crews of these ships and of the Sybille, the Hecla, and Black Joke; and the distemper appeared also in these ships, and became most destructive. These facts cannot be disputed, and whatever attempts may be made to explain them away by self-sufficient cavillers, they will still remain remarkable indications to all common-sense persons of that very important property of the distemper upon which every means of preventing and of restricting its propagation should be based; and to the neglect of which so much misery has been inflicted upon extensive communities, both civil and military, up even to the present day. During the continuance of this epidemic the crews of several trading vessels were nearly altogether swept away. Every person on board of two ships were attacked, and only two survived. This frightful mortality appears to have been mainly attributable to erroneous notions entertained by the medical officers of the colony as to the cause of the distemper, and to the neglect of every precaution against it, and of all means calculated to prevent its extension. Their minds were pre-occupied with one idea, and were incapable of conceiving another. This single article of their faith and belief was malaria; it was their evil genius which distorted their vision, disordered their understanding, perverted their judgment, and rendered them altogether incapable of meeting the crisis, which their incapabilities had tended to develope. Malaria, according to them, was in the winds, in the waters, in the earth, and in the regions under the earth; and yet it did not, they believed, originate where it was so mischievous, but was brought from a distance on the winds, and even over the extensive bay into which the Sierra Leone river empties itself. To this absurdity they joined a second, namely, the belief that a distemper of a continued and rapid course, such as they observed and described, could proceed only from a cause always producing effects of a very different character.*

* Whilst the foregoing pages were passing through the press, the author received the official returns to Parliament respecting the disease which prevailed, in September, 1845, on board the "*Eclair*," steam ship of war, on her return to this country from the coast of Africa. The conveyance of this pestilence to the very shores of Great Britain—almost to the portals of the metropolis—and the alarm of the public mind consequent upon the circumstance, gave rise to the correspondence and documents on the subject, which have been printed, and from these the following particulars are derived:—

The "*Eclair*" steam ship left Plymouth on the 2d of November, 1844, with a crew of 146 officers and men. On the 20th of December she was at the river Gaboon, on the west coast of Africa, and passed thence westwards and northwards along the coast until she arrived at Sierra Leone on the 23d. She there took in 40 Kroomen and liberated Africans, allowed to assist the crew. She departed from Sierra Leone on the 28th of January, and continued off Sheerboro, watching slave-traders, until the 4th of February. During this time, the vessel could not have safely approached nearer than three miles to the shore, owing to the shelving nature of the coast; but the boats were sent in, and the men landed frequently, and slept on shore on two or three occasions. Most of the men who had slept on shore were attacked with fever, which appeared to have been of a malignant kind, as nine or ten of those attacked died; but two of the men who were severely seized had not been out of the ship. These cases occurred during the months of April, May, and June; and were said to have been the endemic remittent of the climate; but no details of symptoms are given. When the vessel returned to Sierra Leone, on the 4th of July, the crew was healthy; but, from that time until her departure on the 23d, the men were engaged in cleaning out the hold of the "Albert" iron steam ship, and were allowed to go on shore, and several of them slept on shore. Of these, four were attacked with fever on the 19th, 21st, 22d, and 23d; one was landed, but the other three were treated on board and died. No account of the symptoms are given. But Sir

139. *h.* From what has been advanced above it may be admitted without any assumption—1*st*, *That this pestilence is altogether different in its causes, progress, and nature, from every form or*

WILLIAM PYM, who went on board on the arrival of the "Eclair" in England, and examined the officers, states that the first man who died after leaving Sierra Leone on the 23d had black vomit, and that the cases which occurred then and subsequently, as well as those which were still remaining, were actually this pestilence. On this point it is impossible for Sir William to have been mistaken; seeing that his experience of this distemper in the West Indies and in the south of Spain has been greater than that of any other physician whatever; and although no description or details are given in the official papers now before the author, yet quite sufficient is stated to show the nature of the distemper.

The "Albert" was taken in tow by the "Eclair," and brought into the Gambia on the 10th of August. After leaving Sierra Leone, three other men were attacked in the end of July and died; these men had also slept on shore; and a merchant who embarked on board the "Albert" at Sierra Leone was also taken ill in that vessel, and died on the 27th of July. The first three of those attacked in August were on board of the "Albert" when taken ill. "Afterwards the fever became indiscriminate in its attacks." The "Eclair" touched at Goree to take in coals, but was not allowed pratique. She went on to Bona Vista, one of the Cape de Verd Islands, where she arrived on the 21st of August, having had, from leaving Sierra Leone, 18 men attacked by the distemper, and of these thirteen died, most of them with the black vomit.

At Bona Vista the disease continued to spread rapidly amongst the crew, when permission having been obtained from the Portuguese governor, it was determined to land the crew, sick and well, and purify the vessel. A fort was appropriated for the accommodation of the seamen and sick, and the officers obtained lodgings in the town. Every means were taken to purify the ship by washing and whitewashing, fumigation, &c.; all the Kroomen remaining on board, with the exception of six employed in attendance upon the sick. The disease, however, continued to prevail amongst the officers and men on shore, thirty-one men having died between the 21st of August and the 13th of September. Under these circumstances a consultation was held by three naval surgeons, and upon their report and recommendation it was determined that the steamer and crew should proceed to England. The ship's company were in consequence re-embarked, and sailed on the 13th of September; Captain Estcourt having been taken ill the day before leaving Bona Vista, and died on the 16th. At Bona Vista, the Assistant Surgeon Harte, of the "Eclair," died, when Dr. McClure, a naval surgeon, passenger in the "Growler," and Mr. Coffy, assistant surgeon of the "Growler," volunteered their services on board; here also seven seamen volunteered from the "Growler." Dr. McClure died on the voyage to Madeira, and one of the volunteer seamen was taken ill of the fever and recovered. Upon the arrival of the steamer at Madeira the authorities refused permission to communicate with shore, as had been previously done by the French at Goree; but at this island Mr. Barnard, a naval surgeon, volunteered his services, and was received on board with two seamen. From the day of her sailing from Madeira, the 21st of September, up to the 30th, seven deaths have taken place from the fever, and eight new cases have occurred.

On the passage from Bona Vista to England forty-one were attacked, and twelve died. In the short time of the vessel's remaining at the Motherbank two men were seized and died. From the time of her being put in quarantine on her arrival until the 31st of October, nine new cases occurred, five of which were fatal. The pilot who was taken on board on the 1st of October to take her to Standgate Creek, was taken ill on the 7th. An officer was also seized on the same day, and both officer and pilot died in three or four days. The surgeon was taken ill on the 4th of October, and the assistant surgeon on the 5th; the former died. The illness of the two surgeons occasioned the sending two other medical officers on the 8th on board the "Eclair," and one of them was attacked on the 11th. After this period but slight illnesses occurred, and the disease entirely ceased soon afterwards, owing to the arrangements made under the directions of the quarantine establishment, aided most probably by the low range of temperature at this season, and in this climate.

There appears to have existed in the minds of the medical officers attached to this vessel a strong belief that the distemper, which was so fatal, was merely the endemic remittent of the African coast. As such they reported the disease, and hence were allowed, with great hospitality and kindness, all the advantages which could accrue from visiting Bona Vista; and yet, when they drew up their report advising the return of the vessel to England, the three medical officers concur in characterising the distemper as "a malignant fever," causing "great mortality;" and in stating that "many fresh cases were daily occurring;" and they further add that "the extremely malignant character of the fever, *which has resisted the treatment usually found successful in the common endemic fever of the coast*, its continuance since the removal of the 'Eclair' from the coast, &c., induce them to recommend the return of the vessel to England;" a resolution most proper in the circumstances; but the very terms in which the recommendation is worded, show a tacit consciousness that they had not the endemic remittent of the climate to deal with. That the distemper was genuine hæmagastric pestilence is shown by the very few particulars furnished by the printed papers as to the appearances and symptoms of the distemper. I state this from my experience of this pestilence and of the endemic remittent of the coast of Africa. Dr. STEWART in his medical report of the few cases which came before him after the 7th of October, when he joined the 'Eclair,' mentions "black vomit and slight yellowness of the skin, which became of a deeper shade after death. In the second case there was hiccup during the last fifteen hours of life, and with the hiccup a plugging, guggling sound, which conveyed an assurance that had it been possible to examine the stomach after death, coffee-ground fluid would have been found in it. There was a slight tinge of yellowness in that case, also, during the last hours of life; and after death the body became very yellow, whilst the neck was as dark as if the patient had been strangled." (p. 90.)

That an infectious fever had been introduced into this vessel, and that it spread by infection to all who were attacked, are proved by the history of its progress; by the extension of it to all but one of the medical officers who attended the sick, and the death of most of them; by the introduction and spread of the pestilence to the inhabitants of Bona Vista; by the infection of five of the Kroomen, or native Africans, who are exempt from remittent fever, but not from this pestilence, although they are little subject to it; and of the persons who went on board the vessel after her arrival in England; and by the "fact of the sick attendants from the 'Worcester' getting fever after returning to the 'Eclair.'" (p. 90.)

In further proof of the above, it may be added, that of four officers of the "Growler" steamer sent to survey the purser's stores on board the "Eclair," three of them—the lieutenant, purser, and clerk—were attacked in consequence, and several of the crew; "in all thirteen cases; and two of the three last cases died at Woolwich with all the symptoms of the disease." (p. 77.)

It now remains to notice what occurred at Bona Vista after the departure of the "Eclair;" and, in doing this, it is necessary merely to furnish abstracts from the official reports of the British consul and of H.M's commissary judge to Lord ABERDEEN. Consul RENDALL states—that the "Eclair" was allowed pratique, and permitted to land her crew at Bona Vista on the representation of the medical officers that the cases of fever which had occurred on board were the endemic remittent; that black vomit had not been mentioned; that, seven days after the steamer had left, one of the white Portuguese soldiers who had been housed with the crew of the "Eclair," died in the fort (which had been given up to the crew); that on the following day another also died, and the remaining soldier in the fort (a coloured man) was reported sick; that another coloured soldier sent to assist his comrade was also taken ill; and that the authorities therefore abandoned the fort and island, and caused the two sick men to be brought into the town. The distemper then began to spread, and the first fatal case in the town occurred in the house where the two coloured soldiers from the fort had been brought and recovered from their sickness. "Up to the first week of December the fever continued to rage, and at that period it had found its way into almost all the country villages, the deaths averaging seven or eight daily." "The English have suffered considerably, having lost one third of their number," and amongst them the resident English surgeon, Mr. KENNY. The symptoms were black vomit, pains in the head, back, and thighs, with suppression of urine, and sometimes hæmorrhage. The consul adds that the fever had proved contagious to those who acted as nurses to the sick; this was observed to be the case without exception.

The commissary judge, MACAULAY, in his letter to Lord ABERDEEN, after remarking the usual healthy state of Bona Vista, and the introduction of a malignant fever into it by the "Eclair," notices the improper conduct of the medical officers who had reported the disease to be merely the endemic remittent of the coast, whilst

grade of remittent fever:—2d, That it is infectious in its nature amongst the predisposed, and more especially in a warm, humid, and close atmosphere:—and 3d, That it attacks the human frame only once, the exceptions to this being even fewer than in respect of any other infectious malady.

VII. OF THE ORIGIN OF THIS PESTILENCE.—The next *topics* which may require a brief consideration are those involved in the following questions:—*a.* Can remittent fever, or fever proceeding from malaria under circumstances of crowding, insufficient ventilation, and a high range of temperature, change its character and become this distemper?—*b.* Can the accumulation of the sick of other diseases in a close, hot, and humid air, give rise to this pestilence, or generate its seminium?—*c.* Can the accumulation of a number of persons in similar circumstances, and more especially of a large number of negroes in the close hold of a slave-ship within the tropics, so contaminate the air as to occasion, or otherwise generate, the distemper, the pestilence being thus produced *de novo*, whenever any of the foregoing circumstances exist in a marked or decided manner?—*d.* Does this malady ever arise *de novo* from the decomposition of accumulated animal excretions or exuviæ, or of dead animals in a warm, humid, and still atmosphere; or from exhalations from foul or obstructed drains and sewers during states of the air favourable to their concentration?—*e.* And lastly, is this pestilence propagated only by a specific cause, like to small pox or scarlet fever, that may be preserved for a considerable time in *fomites*, during circumstances unfavourable to its outbreak, but may occasion it as soon as those circumstances supervene which favour its operation, viz. a high temperature and a humid and still atmosphere?

140. *A. Can remittent or periodic fevers proceeding from malaria so change their characters and properties under circumstances of crowding, of insufficient ventilation, and a high range of temperature, as to become this distemper, and to assume infectious properties?*—The solution of this question is by no means easy. The evidence bearing upon it is probably insufficient to prove the negative; but most certainly we have no satisfactory proof of the affirmative. The occasions certainly have not been few on which a large number of persons affected with remittent or other periodic fevers produced by malaria, have been confined in close apartments, or otherwise placed in circumstances favourable either to the evolution of a new character in these cases, or to the production of a distemper with different properties from those attending the pre-existent malady; and yet I can find no satisfactory evidence of such conversion of disease having occurred within the tropics, or in more temperate climates, during hot seasons. I cannot deny the possibility of this conversion; but I have not met with it on two or three occasions of this description which have fallen under my observation; and although it has been contended for by several very respectable authorities, still the evidence in favour of it is not conclusive. In order that the necessary elements of sound conclusions should be furnished respecting it, the proofs of malaria and of its consequences, periodic fevers, should be adduced; and evidence of persons holding communication with others affected with these fevers in a warm, humid, and close air, becoming infected with this distemper, no other source of infection existing, ought to be furnished. The existence of remittent fever and its origin in malaria, the actual conversion of the remittent fever into the true hæmagastric infectious pestilence, and the circumstances connected with this conversion, should be fully and unequivocally shown; or, in other words, the assumption of the properties of the latter by the former, under the circumstances just specified, and the propagation of the assumed properties and converted malady, thus originating *de novo*, in a similar way to other manifestations of this pestilence in an epidemic form, ought to be satisfactorily demonstrated. I cannot, however, satisfy myself, after the diligent attention I have devoted to this topic, that these premises are so established as not to admit of doubt. We do not find in the eastern hemisphere, where remittent and other periodic fevers are prevalent, and where the occasions favourable to the conversion of them into this pestilence are as likely to occur as elsewhere, that such conversion has ever taken place, for there this pestilence is unknown. During the late Niger expedition, the occasions favourable to the conversion of the remittent fever into this pestilence must be admitted, and yet I know that this conversion—that this pestilence, did not result. Similar facts have fallen under my own observation.

141. This doctrine of *contingent infection* owes its origin chiefly to the fact of remittent fever in its worst forms having been so frequently confounded with this pestilence, and to the circumstance of the infectious nature of the latter having been so fully demonstrated as to preclude scepticism, whilst the belief in malaria as the original

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it was obviously a malignant and fatal pestilence; and remarks that these officers, not having "previously served on the African station, had mistaken the malady," declaring from first to last that it was nothing but the common coast fever. He further adds that Mr. MANTELL, the Queen's advocate, who had come from the Gambia to Bona Vista in the "Eclair," first mentioned the occurrence of black vomit in one of those who had died on the passage from the Gambia; but that the medical officers would not admit that any importance should be attached to this circumstance; and he concludes his letter with the same account as the consul has given, of the infection of the soldiers from the crew of the "Eclair," and of the population of Bona Vista from the former (see above). The latest published accounts state the number of deaths in this island to be upwards of 400, and the distemper to be still prevailing.

I cannot refrain from directing attention to the evils which have resulted on numerous occasions, and even more flagrantly and flagitiously than on this, from the confident tone so often assumed by very young and quite inexperienced medical officers on the non-infectious nature of the distemper under consideration, and from the circumstance of their confounding it with the endemic remittent. These false notions are mischievous enough even when entertained by theorists and speculators after popularity with money-getting traders, who view restrictions requisite to the protection of public health as invasions of and abstractions from the amount of their private interests and gains; but they become ten-fold more destructive, when they are made at the caprice or upon the hasty suggestion of an inexperienced and reckless young surgeon, the basis of measures involving the lives of thousands. Why, in the name of all that is honourable and humane, amongst the regular members of our profession—and we believe, as yet, none but such can gain admission into our public services, although such limitations may not be observed in palaces or courts—are not definitive instructions furnished by the heads and boards of the medical departments of the public services, which may guide the inexperienced in devising precautions against the extension of malignant and pestilential distempers when they first appear in ships, garrisons, and armies. The votaries of medical science would, in their simplicity, believe that such ought to be one of the chief functions of those boards; but, alas! this at least does not appear to have hitherto been one of their offices.

cause was still adhered to. But the undoubted and now generally admitted fact, that this pestilence attacks the same individual only once, strongly militates against the conversion in question, and against the *contingent origin* of infection, whilst it strongly supports the doctrine of a specific cause of the malady, different from, and independent of the causes productive of periodic fevers. That the conversion of these non-infectious fevers, under the favourable circumstances mentioned above (§ 140.), into the hæmagastric pestilence, which is afterwards propagated by infection, may be *possible*, I will not attempt to deny. I, however, believe it to be very *improbable*. I know that my own observation and research have not furnished me with any evidence of its occurrence that can be implicitly relied upon; and hence that conclusive proofs of the fact are still required. Besides, most of the outbreaks of this pestilence have commenced by solitary cases, without any instances of remittent fever having then existed in the locality or vicinity, and without any communication having been known between those first attacked and persons labouring under remittent fevers.

142. *B. Can the accumulation of the sick of other diseases in a close, hot, and humid air give rise to this pestilence, or generate its seminium?* What I have stated in answer to the former question also applies to this, and even with still greater force. Without, however, denying the possibility of such an occurrence as that involved in this question, I cannot find sufficient proof of the fact. Moreover, as this distemper possesses certain specific properties analogous to those of other infectious fevers, arising also from a specific cause—as it, like scarlet fever, measles, and small pox, presents regular stages and periods; attacks the same person only once, and spreads amongst the unprotected by means of an effluvium from the bodies of those already affected by it under circumstances favourable to the concentration and operation of that effluvium—so it may be inferred to be no more the contingent result of the accumulation of the sick in a close, humid, and hot air, than any one of the maladies just mentioned as analogous to it; and we know that there is no proof of any one of them having so originated or having been caused by emanations from the sick of diseases different from itself.

143. *C. Can the crowding together of a number of persons in a close, hot, and humid atmosphere, and more especially in the close hold of a slave-ship within the tropics, so contaminate the air as to occasion, or rather generate, this distemper, and thus produce it, de novo, whenever the foregoing circumstances coexist in a marked degree?* That the contamination of the air, especially when it is humid, warm, and close, either by other fevers, or by other maladies, or by a number of persons previously in health confined in it, will take place, so as to produce fevers of a malignant character, more especially that fever which I have called PUTRO-ADYNAMIC (see FEVER, §§ 484—496.), I have shown when treating of that malady (§ 496.); but satisfactory proofs are wanting of this pestilence ever having originated in this way. Since my visit, however, to several places in Africa, and knowing the very limited space in which a large number of slaves are often confined, both on shore and in slave-vessels, I entertained the idea that this pestilence or its seminium, or specific infection, had been generated originally by the congregation of negroes in a close atmosphere, or is generated *de novo* by this race when placed in the circumstances now stated; and that, although it affects them in a comparatively slight manner, it is most particularly baneful to the natives of cold countries; as small-pox is comparatively mild in the white races, whilst it is most pestilential and fatal amongst the negroes. This opinion, entertained since 1817, I have endeavoured to ascertain the truth of whenever I have had an opportunity of making any inquiry respecting it; but the evidence is not sufficient to establish this as the source of the infection. The following, however, may favour the truth of this idea. A small vessel in which I was a passenger was anchored, in May of 1817, a short distance from Sierra Leone; and the ship's boat with four of the crew was bringing me on board when a tornado suddenly overtaking us we took shelter on board of a ship recently brought into the harbour full of slaves, and near which we were at the time. The men belonging to the boat took shelter down between decks. I remained under a small poop on the quarter-deck. All these men in two or three days were seized with this distemper, the vessel having just put to sea, and I escaped. The sick men were constantly kept on deck, free ventilation was enforced, and every possible precaution under the circumstances was used, and no more were attacked.

144. The organisation of the negro, and the more extensive functions of the skin of this race as an excreting organ, give rise to a most offensive and foul state of the atmosphere, when numbers of this race are confined in a limited space, and particularly in a humid and warm atmosphere. Indeed, nothing can be imagined more nauseous and depressing than the respiration of air so contaminated; and it cannot be disputed that the concentrated and virulent effluvium generated from this source poisons the surrounding and sometimes stagnant atmosphere; and it may further be admitted that it so affects the organic nervous system and the blood as to develope this pestilence, when all the circumstances requisite to the production of this effect exist in due force. The above fact, these considerations, and various occurrences or outbreaks of this distemper, after communications with slave-ships that have come to my knowledge, induce me to attach some importance to this source of the evil, and to suggest that some endeavour should be made to ascertain the amount of credit it may deserve. At the same time I must admit, that some of the arguments I have used against the doctrines involved in the foregoing questions may be urged against this.

145. *D. Does this pestilence ever arise, de novo, from the decomposition of animal excretions or exuviæ, or of other animal substances, in a warm, humid, and still atmosphere; or from exhalations from foul or obstructed drains and sewers, during states of the air favourable to their concentration?* The remarks already made also apply, in some respects, to the present topic. If the distemper ever arises from negroes crowded in a confined space, as suggested above, this question should be answered in the affirmative, inasmuch as the accumulated cutaneous excretions in these cases are mainly concerned in causing it. That the putrefaction of animal substances in a humid, warm,

and stagnant atmosphere, will cause malignant fever, cannot be doubted; the only question being, whether this pestilence, or a form of fever, such as I have described under the name of *putro-adynamic* (FEVER. §§ 484—496.), will be the result. Circumstances have proved to me the production of this latter fever in these circumstances, and in forms more or less malignant and rapidly fatal; but I have no proof of the pestilence now being considered having originated in this latter source. The same remark applies to the concentrated exhalations from foul drains and sewers. I believe that these are quite sufficient, especially before they are much diluted by the atmosphere, to occasion the putro-adynamic fever just referred to; but, after examining into the attempts which have been made to connect this pestilence with that cause, I believe them to have been quite futile, and by no means supported by even the slightest evidence. In many warm regions and climates, more especially in eastern countries, as shown in several parts of this work, emanations from the excretions, the exuviæ, and the dead bodies of animals, combine, with the exhalations from a humid or marshy soil, to give rise to a low or putro-adynamic fever, which may present, with more or less malignancy, evident remissions, more particularly when the terrestrial exhalations are the most influential in causing it, as shown in the article FEVER (§ 435. 484.), still this fever will not acquire an infectious character with a moderate attention to ventilation and the avoidance of crowding of the sick. When, however, emanations from the decomposition of animal matters, and from drains and sewers, are concentrated in a warm and humid air, and predominate over those from vegetable matter or from a marshy soil, the resulting fever will assume more or less of the continued type and putro-adynamic characters, and become infectious in circumstances favourable to the manifestation of this property. Still the fever hereby produced (and fully described in the article FEVER, § 434, *et seq.*), is not the pestilence now under consideration; and I cannot find any evidence that this pestilence has ever really originated in this source.

146. In thus disputing the origination of the true pestilential yellow or hæmagastric fever in several sources to which it has been very loosely imputed, it may be stated that my scepticism is caused by the entire want of evidence of the truth of such occurrences, and by the very general assumption, without any proof, of these as the sources of the distemper. I have no favourite doctrine or cause of my own to support; and no theory to subvert, merely because it is different from the one in which I believe. I am most anxious to know the truth, wherever the truth is obscured or difficult of access: but I lean the most to that doctrine which is most truthful, which rests on the most convincing evidence, and which, as being itself truth, is the safest to follow, and is, moreover, the most advantageous to adopt as regards the welfare of the general community.

147. *E. Is this pestilence, like to small-pox and scarlet fever, propagated only by a specific cause that may be preserved in fomites for a considerable time, without causing it, during circumstances unfavourable to its outbreak, but may occasion it as soon as those circumstances supervene which favour its operation, viz. a high temperature, and a humid and still atmosphere?* That the cause is specific cannot be doubted, inasmuch as the effect—the distemper—is also specific or determinate, as the other specific maladies just alluded to. It has been repeatedly observed that this cause has been preserved in the bed and body clothes of those who have been affected by the disease, for a considerable time; either when these clothes have been shut up from the air, or when they have remained during the cold months unexposed or unused; and that, when these fomites have been exposed among susceptible persons, and during states of the atmosphere favourable to infection, the disease has been reproduced. Thus, in several towns in the south of Spain, as shown by most of the authorities already quoted, the distemper has gradually ceased with the accession of cold weather; but it has appeared again in the summer, or as soon as the atmospheric temperature and humidity reached those grades which are requisite to the production of infection. If, therefore, it be admitted, that the distemper is specific—is so determinate in character as neither to lapse into remittent fever on the one hand, nor to pass into plague or putro-adynamic fever on the other; and that the cause is also specific, and like other specific causes capable of being preserved for a considerable period without losing its poisonous properties and capability of germinating and reproducing itself and the distemper, we may further infer, whatever may have been its most remote origin, that it is not a frequent contingent production or result of the circumstances to which it has been imputed, and which have just been passed in review. If it were a contingency merely of one or more of these circumstances, it must have occurred in other warm countries besides those in which it has been so frequently observed. It must in this case have appeared both in the eastern hemisphere and on the shores of the Pacific, where it has never been met with. It may, however, be stated that, whilst this consideration militates against the contingent production of the specific poison causing this pestilence in the circumstances against which I have argued above, it in some degree supports the opinion which I have suggested, as to the not improbable origin of the distemper in the concentrated emanations from the bodies of a great number of negroes confined in the close, humid, and hot holds of slave-ships (§ 143.). If this opinion as to the probable origin of the infectious poison be not admitted, there is certainly none other deserving greater confidence, and we are left entirely in the dark as to the earliest origination of the mischief, although the fact of the communicability and diffusion of that mischief cannot now be disputed, nor the circumstances which favour its communicability, on the one hand, and those which prevent or retard it, on the other. The cause being obviously specific from the very determinate and specific character of its effects, we have no greater reason to believe, in the absence of conclusive proof of the fact, that this specific cause is contingently produced in the course of other maladies, or in the circumstances above considered, than that the specific causes of small-pox, scarlet fever, and of other pestilences, are also contingently produced in similar circumstances.

148. VIII. NATURE OF THIS DISTEMPER.—It has been supposed that the plague of Athens, described by THUCYDIDES and noticed by PLUTARCH,

was identical with this malady; and certainly the resemblance between them is strong in many points. THUCYDIDES states that it prevailed in Lemnus and other places, although not so extensively and fatally as in Athens where it afterwards appeared; that it suddenly broke out in the port, the Piræus, and extended over the city; that when it had reached the upper parts of the city, it had become most fatal; and that, having ravaged Athens, it was conveyed to other places which were most populous. These are the specific statements of THUCYDIDES, and indicate a similar importation of an infectious malady and its extension from the port over the city, and to places with which the intercourse was greatest, to that demonstrated on several occasions in the south of Spain during the last fifty years. The infectious nature of the Athenian plague is still more distinctly stated by PLUTARCH, who remarks that the distemper appeared in the army with which PERICLES besieged the sacred city of Epidaurus, and affected not only it, but all those also who had intercourse with it. (PLUTARCH, *Vita*, &c. 8vo. Lond. 1729, vol. i. p. 378.)

149. Not only in their propagation, but also in their symptoms, may the resemblance between the Athenian and the Hæmagastric pestilences be traced. THUCYDIDES notices the peculiar febrile heat, and the pale greenish yellow (χλωρὸν), and livid colour of the surface of the body; the singular affection of the parts of generation; the excessive sense of internal heat; and the peculiar amentia, insanity, or apathy attending the distemper. The abundant bilious evacuations mentioned by him, may have been the black or dark brown matters characterising the modern distemper, for it cannot be doubted that the black stools produced by altered blood were ascribed to black bile by the ancients. He further notices the very rare occurrence of relapses; the fact of the disease never having seized the same person a second time; and the greater liability of strangers, and of persons from the country visiting the city, to be attacked.

150. Whatever may have been the original source of this distemper, in whatever way the cause of it may have been at first generated, and however this cause may have been afterwards preserved and propagated, there can be no doubt of the appearance of it in many places and on many occasions, where it can be accounted for in no other mode than by referring it to the operation of an infectious emanation proceeding from a recently affected person, or from clothes imbued with this emanation. The difficulty of obtaining information as to the first persons attacked is always great, and sometimes impossible, as respects not only this distemper, but all other infectious diseases; and hence the early proofs of infection can rarely be obtained even as regards any of them. In respect of the outbreak of this pestilence in America, Africa, and Europe, we know that it has occurred both after and during states of season and weather of the most different and even opposite kinds; the only atmospheric requisites to its appearance being high ranges of temperature and of humidity. It has occurred in the driest and in the most marshy situations; in dry as well as in rainy seasons; after prolonged droughts, and after excessive rains; on the surface of all soils, whether rocky, sandy, gravelly, or clayey; and in ports, towns, garrisons, forts, and ships of all descriptions, both foul, clean, unhealthy, and healthy, and placed in every possible circumstance that may be conceived in respect of them. It has appeared in one or two isolated persons who had not previously breathed the foul air of sick wards or apartments; nor visited the places in which either the sick or the healthy had been confined; nor inhaled the effluvium from decomposing exuviæ and animal substances; and thus by the exclusive process of reasoning we have left only that cause to which I have imputed it; and by means of which it is as undoubtedly propagated and perpetuated as any other malady whose infectious properties are admitted.

151. The terrestrial exhalations believed by Dr. FERGUSSON and others to be emitted from the fissures of the soil, caused by prolonged drought, or from the dried-up beds of rivulets, &c.; the wooden theory propounded by Dr. WILSON, and its combination with a limestone influence; the malaria carried by winds from great distances, or issuing forth in currents of only a few feet in diameter; the emanations from bilge-water and ballast; and the vegetative principle imagined to be thrown out from rich absorbent and alluvial soils, are the several sources which have been assigned; but are merely illusions, which have played before the minds of medical theorists, and which are dissipated by a more comprehensive glance of the very different circumstances attending each outbreak of the pestilence. The chief circumstances which remain without very material alteration, in all the most destructive visitations of the distemper, are certain ranges of heat and humidity, a still atmosphere, or an imperfect renewal of the air, and a more or less dense population; all which especially favour the propagation of infection of every kind, and which are indispensable to the extensive prevalence of this distemper.

152. *The Pathological Inferences* which may be drawn from what has been advanced respecting the *causes*, the *symptoms*, and *course*, and the *consequences* of the distemper, may be stated as follows: — 1st. Of the numerous *causes* and *sources* which have been assigned to this pestilence, there is not one which has been ascertained to have existed in all, or even in the majority of, the occurrences of it since it became in modern times the subject of medical interest, with the exception of a *specific infection*, or poisonous animal emanation proceeding from the sick, and directly, or by fomites, affecting those among the healthy who have not previously been attacked, and who are otherwise predisposed. It should not be overlooked, that the majority of those who have reasoned against the operation of this cause have either wittingly or ignorantly overlooked the now well-established fact of the immunity from a second attack, produced by the first, and have attributed much importance to the escape of many of those among whom an infected person has been placed, without admitting the great probability of the majority of those having been protected by their having had the disease. This particularly applies to the inter-tropical parts of America, and to many of those who have written upon the disease as it has there appeared, and who have even never inquired into the manner in which this exemption affects the diffusion and

prevalence of the distemper, nor in any way concerned themselves with this very important fact, although it so very materially affects the results, and although they present themselves before the profession with the dogmatism of an infallible inspiration.

153. Secondly, that the effluvium proceeding from the bodies of the affected being so remarkably offensive as to attract the notice of every observer, is itself a proof of the infectious nature of this distemper; for when it is admitted even in single and isolated cases, how much more remarkable must this fœtor become when numbers are affected in a humid, warm, and still atmosphere, and in a limited space, in which circumstances even the birds in the air and the lower animals are also infected. Dr. IMRAY, who has given a remarkably correct description of this pestilence as it appeared in the island of Dominica in 1838, where it could not be expected to have been very prevalent amongst old residents, owing to the exemption arising from a previous attack, and where, indeed, he states the number attacked to have been small, with the exception of the military, remarks that the "odour of the cutaneous exhalations was often extremely disagreeable, as well to the patient himself as to his attendants," and that "*the fœtor became more intolerable towards the last stage of the distemper.*" Now, I believe that every one whose experience of diseases attended by much fœtor of the exhalations from the skin and lungs, will admit that these diseases are more or less contagious or infectious, especially in the circumstances so frequently alluded to above, and where numbers are exposed to this cause, or inhale an atmosphere contaminated by these exhalations. There can be no doubt, however, that where those exhalations are much diluted by the atmosphere in an open situation, they will generally fail in producing those effects, which undoubtedly result from them in a close, crowded, and humid air, and where numbers of predisposed persons are congregated. The dissipation of these exhalations by a rapid renewal of the air is the chief cause of the limited extension of the distemper to high and open situations, and to places thinly inhabited, and is one of the chief means of arresting the progress of an epidemic, facts proving what reason asserts, namely, that on those occasions of the outbreak of the distemper in close streets and barracks, the removal of the inhabitants to open and airy grounds and encampments, so that a free perflation is allowed under the tent-cloths, is always followed by a rapid subsidence and total disappearance of the malady. A person from the country visits a town in which the malady is prevalent, and another from a ship lands in the same town, and both persons probably visit the same place or house in which the disease exists. Both persons, if unprotected by any circumstances, and equally predisposed, are infected, but the infection will not become manifest until two or three days subsequently. The one returns into the country and is attacked, but owing to the circumstances favouring the communication of the malady being wanting there, — owing to free ventilation, a high and airy situation, and a sparse population, with numerous other favourable circumstances, — the distemper either extends no further, or extends merely to a few, even in the absence of any other sanatory measures; whilst the sailor returns to his ship, and in the ill-ventilated, and perhaps over-crowded forecastle, or between decks, where he is confined, he communicates the malady to every one who is not protected by a previous attack. Now, these occurrences have actually taken place, as now stated, times out of number; and, moreover, the additional fact has been often observed of a third person having come from a distant town and city, been infected at the same place as the two others, and carried the infection to such town where he has sickened, and owing to crowding, ill-ventilation, and other circumstances favouring infection, the malady spreads rapidly, although it has proceeded no further as respects the first person here instanced.

154. Thirdly, if we connect the circumstances attending the impression made by the exciting cause of the distemper, — by the effluvium from the affected, — if we consider the phenomena which immediately result, those which are subsequently developed, and the lesions which are ultimately produced, we shall have every reason to conclude that this cause produces a specific morbid impression upon the organic nervous system, through the medium of the lungs; that it changes the vital manifestations of this system, and contaminates the blood; and that this contamination further affects the organic and cerebro-spinal nervous systems, which again, in their turn, re-act upon the vascular system and blood, until the vital tone and cohesion of the tissues and capillaries are remarkably impaired, and the vital crasis of the blood more or less dissipated.

155. Fourthly, it cannot be doubted, by any person who has seen both maladies, and who is uninfluenced by partisan views, that this pestilence is altogether distinct in its causes, its progress and course, and in the lesions found on dissection, from more malignant states of remittent fever. The admission is made by many of the non-infectionists themselves; and sufficient has been adduced above (§§ 37. 122.) to prove this difference. In those cases of the pestilence which proceed more rapidly to the extinction of life, the poisonous emanation which has infected the body produces but little structural lesion in its fatal course, excepting the changes in the digestive mucous surface and in the vascular system, especially in the blood. The viscera present no remarkable alteration beyond the defect of vital cohesion just mentioned, and the tendency to rapid decomposition. The pale yellow appearance of the liver, first accurately observed by the French physicians, who described the distemper as it appeared in Spain, and subsequently noticed in the West Indies by Dr. IMRAY and others, is obviously occasioned by the loss of blood from the digestive mucous surface. The loss of the vital cohesion of this surface and of the capillaries supplying it, and the more or less extensive detachment of the epithelium, with the other changes described above (§ 26, *et seq.*), are consequences of the remarkable depression of the organic nervous or vital energy, and of the changes produced in the blood by the poisonous emanation causing the infection.

156. Fifthly, that the changes produced on the blood are not merely the ultimate effects of the disease, but supervene, to a certain extent, at a more or less early stage, in consequence either of

the morbid impression made on the organic nervous system by the exciting cause, or of the absorption of the cause into the blood itself during the respiratory process, or of a combination of the two modes of operation, is sufficiently evident from the appearances of the blood during the earlier periods of the malady. In the cases where the vital depression and changes in the blood are the greatest at these periods, blood-letting would be improperly, and has been rarely, resorted to; but in those cases where vascular tone and action have been less impaired, and where the blood has consequently presented the least amount of change observed in this distemper, this fluid, even at the time of its escape from the vein, has been more or less altered. It has generally been much darker than natural, and it has separated very imperfectly into serum and crassamentum. This change in the blood, remarked and described by me many years ago, is further noticed by Dr. IMRAY in the epidemic observed by him in the West Indies. He states that "the blood, as it flowed from the arm, presented a singularly mixed appearance, as if the vein had contained two differently coloured fluids, the one bright red, the other almost black; and on examining the blood an hour or two after being withdrawn, the separation into serum and crassamentum had taken place very imperfectly. In the centre was observed a loose coagulum, easily broken down, the surface of which was streaked green and yellow, the serum being in large quantity, and intimately mixed with the colouring matter of the blood. These changes in the vital fluid were invariably noticed to a greater or less extent in every instance where blood-letting was had recourse to, which was always at the very outset of the attack; and as the disease advanced to the last stage, the blood was so altered and broken down as to escape from the capillary vessels of all the mucous surfaces." (p. 92.)

157. Sixthly, the changes in the digestive mucous surface more especially, and in the crasis and constitution of the blood, favour the escape of this fluid from this surface, and these are necessarily followed, near the close of the attack, and when the black vomit and anal evacuations are very abundant, by an anæmial state of the liver, giving rise to the pale yellow hue of it so generally observed after death. At an advanced stage of the malady more especially, and even from a very early period, the organic nervous or vital power, by which the portal circulation is chiefly carried on, is more or less impaired; and, consequently, the abdominal organs and digestive mucous surface become congested. As vital power and the crasis of the blood are further impaired with the progress of the disease the congestion increases, and ultimately the digestive mucous surface allows the altered blood to exude from the weakened and overloaded capillaries; and the discharge from these capillaries into the digestive canal proceeds with an increased rapidity as the portal circulation becomes more and more impaired. The loss of blood from this surface at last leaves the vessels of the liver comparatively empty, and the organ pale, notwithstanding the dark appearance of the blood at this period. The changes which are thus early and extensively produced in the vascular system and gastric organs, and the prominence of the symptoms referrible to them during the progress of the distemper, have suggested the name *hæmagastric*, which I have used to designate the distemper, and to distinguish it from those states of remittent fever which are often attended by yellowishness of the skin.

158. Seventhly, although the digestive organs and vascular system betray the most prominent affection during the progress of the distemper, still the nervous system, and more particularly the organic nervous system, with the organs chiefly supplied by it, are very remarkably, and most probably primarily, affected. The morbid impression made upon this system, and the contamination of the blood, whether they be produced in succession or contemporaneously, ultimately at least react on each other, until the functions of vital and of excreting organs, and the vital cohesion of the several tissues, are impaired to an extent incompatible with the continuance of life. The consequences necessarily flowing from the morbid impression made by the cause of distemper upon the nervous systems are impairment of the functions of the lungs — the channel through which this impression is made — diminished secreting and assimilating actions of the liver; and consecutively an almost total suspension of the functions of this organ and of the kidneys. A marked diminution, also, of the cutaneous and intestinal exhalations and secretions is present from an early period of the attack. The results of these changes, as respects the blood, are the accumulation of effœte and injurious elements in this fluid, and the combination of them, as they are partially eliminated from secreting surfaces, into those specific infectious emanations which propagate the pestilence. When the alterations in the nervous and vascular systems, in the blood, and in the several tissues are approaching an acme, the altered blood exudes from the relaxed capillaries and tissues, especially from the digestive mucous surface; and when the passive hæmorrhages which thus supervene are considerable, previous congestions are removed, and the portal vessels and larger veins are either left comparatively empty, or contain a small quantity of black fluid, or semi-dissolved blood. With the failure of organic nervous power, the due adaptation of vascular tone to the states of vascular fulness on the one hand, or of vascular deficiency on the other, is lost, and the progress to a fatal issue is greatly accelerated, without the conservative influence of life being able to arrest the advance. But when the passive hæmorrhages in the last stage are considerable, the fatal result is rapidly accelerated, owing to the powers of life being inadequate to the adaptation of vascular tone and action to the amount of circulating fluid, and to the quality of this fluid being such as further depresses the already depressed state of the nervous systems.

159. Eighthly, whether the progressive alterations in the blood actually arise as stated above (§ 154.), or are owing to the introduction, into the circulation, of the infectious molecules given off from the affected, and inspired with the air in which these molecules float, is a question which does not admit of a positive answer in the present state of our knowledge. If we adopt the latter alternative it follows, that the absorbed molecules,

which infect the system, multiply themselves either in the blood or during the processes of excretion; and that the morbific leaven thus introduced gives rise to the progressive phenomena of the disease in the process of reproducing their kind, and in the course of vital deterioration and vascular contamination.

160. The inferences which I have now attempted to draw from what appears established as to the *causes* and *nature* of this pestilence, must, at least in the present state of our knowledge, be made the basis of those measures which should be adopted, 1*st*. *For the protection of the general community*; 2*d*. *For the prevention of individual attacks in circumstances of imperfect general protection*; *and* 3*d*. *For the recovery of the affected*. As the measures for the attainment of the 1st and 2d of these objects are nearly the same as regards the three kinds of pestilence discussed in this article, I shall consider this important topic in a separate chapter, and with reference to each of these pestilences. (See PESTILENCES, GENERAL AND INDIVIDUAL PROTECTION FROM.)

161. IX. TREATMENT.—There are very few distempers which are less under the control of treatment than that now under consideration, or in which the protective influence of life is less manifestly exerted. Persons who are the most robust, the previously healthy, the young, and those in the vigour of life, are generally the most susceptible of infection, the most violently attacked, and often the most rapidly carried off. Something, however, may be attributed to the dose of the infectious emanation, or poison, which has impressed and contaminated the frame; and something, also, may be owing to the violence of reaction in persons of a plethoric habit of body and strong constitution. In the first case, the concentration and intensity of the cause may be so great as to overwhelm even the most powerful, and to annihilate altogether that vital resistance which is always opposed, in various grades in different persons, to the influence of injurious agents; in the latter case, excessive action, whilst vital power is depressed, rapidly exhausts itself, and accelerates, with remarkable rapidity, those changes in the blood which so generally supervene upon high vascular action in warm climates or in hot seasons, and more especially in robust and plethoric persons who have recently migrated from a cold to a warm country. From this it is manifest that the treatment which is advantageous to persons circumstanced as these latter are, cannot be equally, or even at all, beneficial to others who are otherwise circumstanced, or to those who have resided long in a warm, or in an unhealthy climate; and it is equally obvious that medical means will be of service, or even detrimental, to the person requiring them, according to the judgment regulating the exhibition of them appropriately to the morbid conditions existing in each case individually, and in the same case, at the several stages of its course.

162. The treatment, also, should be modified, or even very different, according to the circumstances in which the patient is placed during its employment, for the patient who is removed into an open, well-aired, and healthy locality before he is attacked, will bear, and indeed require, very different measures from those required by persons who remain in the close, low, and infectious air of a crowded hospital, or in the sick bay of a ship of war. Hence the necessity of removing those who are attacked as much as possible from under the influence of the contaminated air in situations where numbers are affected, and of preventing the air surrounding them from being contaminated by as rapid a renewal of it as possible. Thus, in cases of infection in low and ill-ventilated houses and streets, removal to a well ventilated hospital, or even tents having a continued current of air passing under the tent cloths, is most beneficial, not merely as respects the chances of recovery, but also in arresting the progress of infection, for the contamination of the air surrounding the patient is thereby prevented, at least to that degree which is hurtful to himself and infectious to others. In the instance observed by myself, of several sailors becoming infected by communicating with a slave ship, the sick were constantly kept on deck, sheltered only from the sun by means of an awning, open all around, and the result was most favourable as regarded the infected, the distemper not extending further than to those men who had gone on board the slave ship.

163. Impressed with the necessity of applying the means of cure with strict reference to the peculiarities of individual cases, and of each stage of these cases, I shall not attempt to describe the treatment which is more especially applicable to the disease as it occurs in different *constitutions* and *temperaments*, because I should thereby be led into irksome repetitions, and very imperfectly accomplish the end in view. Besides, different constitutions and temperaments are not so readily recognised, nor are they so precisely marked out, as to enable practitioners of even admitted discernment to detect them during the tumultuous disorders of function characterising this distemper. The means which are particularly suitable to *grades of intensity*, and to *the several stages of the disease*, may be stated with more reasonable hopes of advantage to the inexperienced; still it should not be overlooked that the malady is very mutable in its character, and that an attack which may appear very slight, and by no means dangerous, during the second, third, or even the fourth day, may suddenly change its state, and become remarkably severe, or even rapidly fatal. Having particularised the several grades (§ 6, *et seq.*) and stages (§ 21, *et seq.*) of this distemper, I shall first give a rapid sketch of the treatment which appears to me the most appropriate to each *grade* and *stage*, and afterwards notice those means individually which have been, or may be, employed, and endeavour to estimate the true value of each.

164. *i.* TREATMENT AS TO GRADE OR FORM.—*A.* IN THE MILDEST FORM (§ 6.), our chief reliance should be placed on free ventilation, and due promotion of the several secretions and excretions; measures equally applicable to all forms of the distemper. The bowels ought to be early evacuated by means of calomel with jalap or rhubarb, or any other purgative, and afterwards kept open by olive oil taken by the mouth, and administered freely in enemata. A tepid bath or the cold affusion may be resorted to, if there be much heat of skin; and, after the surface has been carefully dried, frictions of the trunk and all the limbs with olive oil will prove extremely beneficial, and favour a free perspiration. This object will be further promoted, after the bowels

have been freely evacuated, by the exhibition of the liquor ammoniæ acetatis, and the spiritus ætheris nitrici, in bland diluents or demulcents. In the majority of cases of this grade, nothing more than the above may be required; light farinaceous articles of food and simple emollient diluents being allowed as the febrile action subsides. If, however, the abdominal excretions are not duly evacuated by these means, they should be repeated in increased doses; the oil should be more freely administered, and the oleum terebinthinæ, or common salt, may be added to the enemata, which may be repeated according to circumstances. If the malady should suddenly assume a severer form, the treatment hereafter to be described may be resorted to. The physician should endeavour throughout to inspire confidence in the mind of the patient, and to dissipate desponding ideas.

165. *B.* THE TREATMENT OF THE MORE SEVERE FORM (§ 7.) of this pestilence is generally beset with more or less difficulty. In many instances a recourse to the foregoing means may be the most judicious, at least until the more serious symptoms characterising this form supervene; and they are the more likely to be of service if the bowels are freely acted upon by them, and if the perspiration is copious and general. In these circumstances, a recourse to the more heroic and perturbating means may be productive of more mischief than benefit. Where vascular action appears high, bloodletting has been advised by many, and many have been induced to employ it, and to repeat it even oftener than once; the seductive calm produced by it for a few hours, often alluring the reckless and the inexperienced to carry it to an injurious amount. But the calm is only momentary, and is generally followed by reaction still more violent than that preceding it, although vital power and resistance are materially depressed. Unless in the circumstances hereafter to be noticed (§ 167.), and regulated as will be mentioned, this measure is of doubtful efficacy, and in most instances should not be resorted to.

166. If the means now mentioned be followed by a subsidence of the disease, attention to the several secretions and excretions, and to diet and regimen, will insure recovery; but if the morbid actions assume an onward course—if the pulse become weak, compressible, unequal, irregular, or slow; and more especially if discolouration of the skin about the neck, chest, &c. appear, either alone or with increased irritability of stomach, a most dangerous exhaustion of vital power has now taken place, and powerful stimulants, or other restoratives, as about to be advised for the *third stage* of the malady, are urgently required. To these symptoms black vomit and hiccup are soon added, if they be not removed by energetic means: and in many instances such means will fail in producing the desired effect. Nevertheless they should be employed perseveringly, and be variously associated, according to the changing features of the case. Sulphate of quinine, with camphor and capsicum, or with the addition of opium, each dose being immediately followed by a glass of champagne; friction of the general surface with olive oil and spirits of turpentine, or embrocations of these kept constantly applied over the epigastrium and abdomen, by means of flannel frequently imbued with them; enemata with olive oil, turpentine, and assafœtida; and even more powerful stimulants than the above, as brandy with an equal proportion of water, ammonia, or others hereafter to be mentioned, are the chief means on which any reliance can now be placed. If black vomit be imminent, or commence, an occasional dose of spirits of turpentine with olive oil, and two or three grains of capsicum; sulphate of quinine, with sulphate of zinc and opium; or the acetate of lead with camphor and opium; the acetate of lead, with creosote, acetic acid, and tincture of opium, brandy in small quantity, but given frequently with arrow-root, sago, &c., and the enemata already advised, may, even in this almost hopeless state, be followed by recovery in some instances. In all cases, a careful watching for the successive changes taking place in the advanced course of the malady, and a recourse to means which are appropriate to them, with good nursing, are amongst the most essential requisites.

167. *C.* THE TREATMENT OF THE THIRD FORM (§ 9.) is not very different from that just considered. Bloodletting, if at all resorted to, should be employed only at the commencement of vascular reaction, and be confined to the young, plethoric, and robust. It ought not to be carried so far as to produce at any time full syncope, for excessive reaction is the more likely to return when this effect is produced by it. Even in this form, and in this class of patients, it is doubtful whether or no general bloodletting is of service. I believe that it will rarely prove beneficial in those cases which remain during the treatment within the range of the contaminated atmosphere surrounding numbers of persons affected by the pestilence, or in low, humid, and ill-ventilated places. An early recourse to the tepid bath, followed by frictions of the surface with olive oil; to purgatives and cathartics with calomel, in full doses, and promoted by enemata containing olive oil and turpentine; and to the diaphoretics already mentioned (§ 164.), ought not to be neglected. When the vascular excitement is about to lapse into exhaustion, the means already advised, as well as those about to be noticed (§ 173.), are the most deserving of confidence.

168. *D.* IN THE FOURTH FORM (§ 11.) of this malady, bloodletting in any mode is most injurious; and the means required for the third stage (§ 172.) are early required. The early exhibition of chologogue purgatives in full doses, and the promotion of their action by means of the enemata already mentioned, and by olive oil taken internally, in frequent doses; the warm bath, followed by assiduous frictions of the surface with olive oil and turpentine; and an occasional dose of spirits of turpentine (from one to four drachms), with one or two drops of creosote, and two or three grains of capsicum, taken on the surface of milk, coffee, or any aromatic water, aided by the more powerful stimulants noticed above (§ 166.), as the symptoms may indicate the necessity of having recourse to them, are the means most likely to make that impression upon the system which is required to subvert the morbid action, to support the conservative influence of life, and to restore the secreting and excreting functions. When yellowness of the skin, black vomit, or passive hæmorrhage supervene the measures already mentioned, and others to be noticed in the

tized, the same result follows as from the first bleeding, "and to whatever extent it may be carried, or however often repeated, no permanent impression is made upon the disease, but the stage of collapse is hastened and the strength becomes much impaired by the loss of blood, rapid sinking being the consequence." (p. 85.) It will generally be found more beneficial in cases of local congestion or prominent affection of an important organ, especially where moderate bloodletting is indicated, to have recourse to local depletions, by cupping below the shoulder blades, or by leeches behind the ears, or in other situations, and to an amount which will be indicated by the circumstances of the case, than to resort to large bleedings from a vein.

175. *B. Mercurials*, more particularly *calomel*, have been much employed in this distemper since they were so strenuously recommended for it by Dr. CHISHOLM; but in this, as well as in all other malignant diseases, confidence in them, either alone or chiefly, will be followed by disappointment. In the West Indies and America, in the south of Spain, and in Africa, *calomel* has been given by many physicians for the cure of this pestilence, in large and frequently repeated doses, with the view of bringing the system under its influence as speedily as possible; but the difficulty of effecting this object was generally in the ratio of the severity of the malady. It is stated by Dr. IMRAY, that "the more malignant the symptoms the less probability there was of the calomel exerting its specific action; but even where this object was attained, the patient could never be pronounced absolutely safe, inasmuch as cases terminated fatally when calomel had been given in large quantities, and the system was decidedly under its influence;" and that when the desired object of salivation was produced by enormous doses of calomel, "recovery, if it did take place, was much protracted, and intolerable sufferings inflicted on the patient. In the more malignant cases, the only approach to salivation was swelling and soreness of the gums, tongue, and throat, with a decided increase of the tendency to hæmorrhage from the mucous surfaces." There can be no doubt of the accuracy of these remarks as regards a recourse to frequent and large doses of calomel when given alone; but when full doses of this medicine are prescribed early in the disease with purgatives or cathartics, or when they are continued after free evacuations of the bowels, in conjunction with large doses of camphor, capsicum, and opium, a much more beneficial result is produced by them. I have had many opportunities of testing the effect of large quantities of calomel given alone, in several malignant distempers, and have observed the general failure of the practice; but when the calomel was conjoined with equally large doses of camphor, capsicum, and opium, and employed thus combined early in the disease, the result has been very different; more especially when these remedies have been aided by the application of the warm epithems and frictions of the surface, and by the enemata already recommended (§ 166.); recovery having very frequently taken place in most unfavourable cases and circumstances, and often without salivation having been produced. Much certainty was to be ascribed to the medicines conjoined with the calomel and to the rest of the treatment; but something certainly was also owing to this latter substance. I believe, however, that the effects of these conjoined means are much more beneficial than may be inferred from their individual operation, not only in removing the irritability of the stomach and internal congestions, but also in restoring the secretions and excretions, and in calming the perturbation of the nervous and vascular systems. The quantities of those substances which I have prescribed, and the intervals between the doses, have varied much with the character and nature of the attack; but I have given from 5 to 20 grains of calomel, with 3 to 15 of camphor, 2 to 5 of capsicum, and from one third of a grain to one grain of pure opium every four or six hours; and in some instances, where it was not necessary to give the former of these substances so frequently, I have prescribed even a larger dose of the opium.

176. *C. Purgatives* are required in all the forms of this pestilence, and more especially early in the attack — not merely for the evacuation of accumulated morbid secretions and excretions, but also for the promotion of the functions of the liver and intestines; and the selection of them is generally a matter of some moment. A full dose of calomel may be given with jalap or the compound extract of colocynth, and half a drop or drop of croton oil; and be followed by the infusion of senna with a neutral salt and an aromatic tincture, and shortly afterwards by the oleaginous enemata already advised (§§ 164. 166.). These will be less apt to offend the stomach, if one or two drops of creasote be added to each dose. The quantity of calomel may vary from 5 to 20 grains; and may be taken with the other ingredients in the form of bolus, or of pills. After the free action of these, the frequent recourse to sweet oil, in the earlier stages, and of this oil with spirits of turpentine, in the last stage, as noted above (§§ 166. 173.), aided by enemata, will generally procure a sufficient evacuation of the bowels; more especially if calomel be given with camphor, capsicum, and opium, as already mentioned (§ 175.).

177. *D. The irritability of stomach*, so constantly attending the disease, is not only a distressing symptom of itself, but is one interfering remarkably with the exhibition of medicines, and preventing their retention by the stomach and passage into the intestines. In order to allay this state, various means have been devised. Blisters, bleeding, opium, effervescing medicines, &c., were those most commonly had recourse to when I visited intertropical countries in 1817 and 1818; but I soon perceived their general inefficacy. Bleeding often aggravated, although it frequently mitigated for an hour or two, this symptom. Blisters produced only a very temporarary effect. Effervescing draughts occasioned a more rapid and complete evacuation of the stomach, and often a painful reaction of this organ upon the distension produced by the fixed air. Opium often produced no sensible effect when given alone, or with fluids, it being generally thrown off; I therefore gave it with full doses of calomel and capsicum, and found great benefit derived from it. The beneficial influence of these upon the state of the stomach was much promoted by the application of turpentine epithems over the

or hock, with soda-water or seltzer-water, or with milk; small quantities of brandy in spruce beer; and, in other circumstances, seltzer-water with milk, or milk with lime-water, are to be preferred. In general it is preferable to allow a considerable portion of the fixed air to escape before the fluids containing them are taken, as this air distends the stomach, occasioning a reaction of its coats, followed by the rejection of the distending body, in the form either of painful eructations, or of vomiting.

172. C. THE TREATMENT OF THE THIRD STAGE (§ 23.) has been partly anticipated (§§ 168. 171.). In the favourable cases of the distemper, the vascular excitement glides into a calm, attended by a return of the secretions, and by a general and genial warm perspiration; and the third stage, or that of vital depression or exhaustion, can hardly be said to have appeared. But unfortunately, in the more violent attacks, and when the vascular excitement of the second stage has been excessive or violent, vital power is so depressed or overwhelmed as to be unable to make the usual resistance, or it sinks in the struggle. When such sinking or exhaustion appears, whether suddenly or more gradually, the energies of life require to be supported by means which may be rationally inferred to be commensurate with the existing depression. It will be seen, from what I have stated above (§§ 170, 171.), that I would advise the depression characterising this stage to be anticipated by a somewhat earlier recourse to stimulants than has been advised by some writers; for I am confident, from my limited experience in this distemper, and from a more familiar acquaintance with the vascular excitement attending the earlier stages of other malignant fevers, that a judicious recourse to those remedies may be had much earlier in these diseases than has usually been advised. This fear of stimulants and restoratives has arisen from the rapid, tumultuous, and expansive state of the pulse; the restlessness, nervous excitement, and harsh heat of skin, so generally present, so frequently misinterpreted, and so injuriously treated by evacuants and other lowering remedies; the remarkable loss of power accompanying this state, and the morbid condition of the blood — circumstances strongly militating against such treatment—being entirely overlooked, or, if taken into account, being inaccurately estimated.

173. Anticipating, therefore, with more or less decision or activity the accession of vital depression in this stage, by commencing the exhibition of stimulants before the stage of excitement or reaction has altogether ceased, these medicines should be still more strenuously prescribed after this stage has actually supervened. In the fourth form of the malady, where vital reaction or excitement is very imperfectly developed, the treatment appropriate to this period should be employed without hesitation or delay. In several instances of the distemper which came under my care in Africa, I had exhausted the various combinations of camphor with nitrate of potass; of ammonia, ether, and aromatic spirits; and of cinchona, serpentaria, and capsicum, in the treatment of this stage, without deriving that benefit from them which I had expected. I then had recourse to the following — to warm cloths imbued with spirits of turpentine and kept constantly applied to the epigastrium, abdomen, and insides of the thighs; to brandy with an equal quantity, of warm water, or in sago, arrow-root, or in spruce or ginger beer, &c.; to enemata with oil, spirits of turpentine, and camphor, or assafœtida; to camphor with capsicum, either in the form of pills or bolus with opium, or rubbed up with olive oil and taken on the surface of some aromatic water, or spirits and water; to Madeira and other wines, either alone or with soda-water and ammonia; and, when hæmorrhages and black vomit either were threatened or had appeared, to spirits of turpentine in various forms and combinations, and the results were certainly most beneficial, several cases having recovered that presented some of the worst symptoms of this stage of the malady. The quantity of wine or of spirits taken in some of these cases, was most remarkable, and generally with no other effect than that of allaying the sickness and vomiting, and calming the restlessness, tremor, and delirium. It was often found necessary to the securing of a successful issue, in these cases, to repeat the stimulus frequently, and to continue the treatment for several days. It was remarked that thirst, heat at stomach, and anxiety were more certainly removed by these stimulants than by milder fluids, or by simple diluents. I have mentioned these means, having experienced their good effect; but it is very probable that the addition of *creasote* to some of them, as to the camphor, capsicum, and opium, and that the further addition of the acetate of lead to the creosote and to these, would have increased the benefit derived from them.

174. iii. REMARKS ON VARIOUS METHODS AND MEANS OF CURE.—*A. Bloodletting.* It is generally found that the usual mode of treating fevers, occurring to persons who have recently migrated to places within the tropics, sanguineous depletions,—a mode generally found beneficial and even necessary in young and robust Europeans—is not only inefficacious, but often highly injurious, even in those persons when attacked by this pestilence. The experience of Dr. IMRAY as to this very important topic, is so accordant with my own, and with that of the most discriminating and judicious physicians, that I shall adduce it here, in almost his own words. Although a few instances, he remarks, of recovery take place after bloodletting, yet the effect seems rather an acceleration of the fatal event. Where, from the onset, the pulse is feeble, and the prostration of strength extreme, the abstraction of blood is clearly contraindicated; "but on the other hand, when the patient is young and robust, the pulse strong, the skin burning hot, and gastric irritation constant, it at first sight seems evident that a prompt and decisive use of the lancet is urgently demanded; and yet when depletion is carried to its fullest extent, the only good effects produced are but a temporary alleviation of the symptoms." When the blood is allowed to flow until faintness or actual syncope take place, the patient afterwards expresses himself greatly relieved; the violent headach, pains in the back and lower extremities are removed, and the skin becomes cool and moist. This short respite unhappily lasts but a very short time, giving place, after one or two hours, to a renewal of all the symptoms, perhaps in an aggravated form. If bloodletting be again prac-

tised, the same result follows as from the first bleeding, "and to whatever extent it may be carried, or however often repeated, no permanent impression is made upon the disease, but the stage of collapse is hastened and the strength becomes much impaired by the loss of blood, rapid sinking being the consequence." (p. 85.) It will generally be found more beneficial in cases of local congestion or prominent affection of an important organ, especially where moderate bloodletting is indicated, to have recourse to local depletions, by cupping below the shoulder blades, or by leeches behind the ears, or in other situations, and to an amount which will be indicated by the circumstances of the case, than to resort to large bleedings from a vein.

175. *B. Mercurials*, more particularly *calomel*, have been much employed in this distemper since they were so strenuously recommended for it by Dr. Chisholm; but in this, as well as in all other malignant diseases, confidence in them, either alone or chiefly, will be followed by disappointment. In the West Indies and America, in the south of Spain, and in Africa, *calomel* has been given by many physicians for the cure of this pestilence, in large and frequently repeated doses, with the view of bringing the system under its influence as speedily as possible; but the difficulty of effecting this object was generally in the ratio of the severity of the malady. It is stated by Dr. Imray, that "the more malignant the symptoms the less probability there was of the calomel exerting its specific action; but even where this object was attained, the patient could never be pronounced absolutely safe, inasmuch as cases terminated fatally when calomel had been given in large quantities, and the system was decidedly under its influence;" and that when the desired object of salivation was produced by enormous doses of calomel, "recovery, if it did take place, was much protracted, and intolerable sufferings inflicted on the patient. In the more malignant cases, the only approach to salivation was swelling and soreness of the gums, tongue, and throat, with a decided increase of the tendency to hæmorrhage from the mucous surfaces." There can be no doubt of the accuracy of these remarks as regards a recourse to frequent and large doses of calomel when given alone; but when full doses of this medicine are prescribed early in the disease with purgatives or cathartics, or when they are continued after free evacuations of the bowels, in conjunction with large doses of camphor, capsicum, and opium, a much more beneficial result is produced by them. I have had many opportunities of testing the effect of large quantities of calomel given alone, in several malignant distempers, and have observed the general failure of the practice; but when the calomel was conjoined with equally large doses of camphor, capsicum, and opium, and employed thus combined early in the disease, the result has been very different; more especially when these remedies have been aided by the application of the warm epithems and frictions of the surface, and by the enemata already recommended (§ 166.); recovery having very frequently taken place in most unfavourable cases and circumstances, and often without salivation having been produced. Much certainty was to be ascribed to the medicines conjoined with the calomel and to the rest of the treatment; but something certainly was also owing to this latter substance. I believe, however, that the effects of these conjoined means are much more beneficial than may be inferred from their individual operation, not only in removing the irritability of the stomach and internal congestions, but also in restoring the secretions and excretions, and in calming the perturbation of the nervous and vascular systems. The quantities of these substances which I have prescribed, and the intervals between the doses, have varied much with the character and nature of the attack; but I have given from 5 to 20 grains of calomel, with 3 to 15 of camphor, 2 to 5 of capsicum, and from one third of a grain to one grain of pure opium every four or six hours; and in some instances, where it was not necessary to give the former of these substances so frequently, I have prescribed even a larger dose of the opium.

176. *C. Purgatives* are required in all the forms of this pestilence, and more especially early in the attack — not merely for the evacuation of accumulated morbid secretions and excretions, but also for the promotion of the functions of the liver and intestines; and the selection of them is generally a matter of some moment. A full dose of calomel may be given with jalap or the compound extract of colocynth, and half a drop or drop of croton oil; and be followed by the infusion of senna with a neutral salt and an aromatic tincture, and shortly afterwards by the oleaginous enemata already advised (§§ 164. 166.). These will be less apt to offend the stomach, if one or two drops of creasote be added to each dose. The quantity of calomel may vary from 5 to 20 grains; and may be taken with the other ingredients in the form of bolus, or of pills. After the free action of these, the frequent recourse to sweet oil, in the earlier stages, and of this oil with spirits of turpentine, in the last stage, as noted above (§§ 166. 173.), aided by enemata, will generally procure a sufficient evacuation of the bowels; more especially if calomel be given with camphor, capsicum, and opium, as already mentioned (§ 175.).

177. *D. The irritability of stomach*, so constantly attending the disease, is not only a distressing symptom of itself, but is one interfering remarkably with the exhibition of medicines, and preventing their retention by the stomach and passage into the intestines. In order to allay this state, various means have been devised. Blisters, bleeding, opium, effervescing medicines, &c., were those most commonly had recourse to when I visited intertropical countries in 1817 and 1818; but I soon perceived their general inefficacy. Bleeding often aggravated, although it frequently mitigated for an hour or two, this symptom. Blisters produced only a very temporarary effect. Effervescing draughts occasioned a more rapid and complete evacuation of the stomach, and often a painful reaction of this organ upon the distension produced by the fixed air. Opium often produced no sensible effect when given alone, or with fluids, it being generally thrown off; I therefore gave it with full doses of calomel and capsicum, and found great benefit derived from it. The beneficial influence of these upon the state of the stomach was much promoted by the application of turpentine epithems over the

potass was recommended many years ago by Dr. GARNETT and others; and for more than thirty years I have employed it in the low adynamic states of fever, more especially in malignant scarlet fever, with carbonate of soda and *hydrochloric æther*, in the decoction of cinchona or the infusion of valerian; combinations which, with some modifications or additions, might be prescribed with advantage in this pestilence, if not delayed until a too advanced period.

185. *G.* The *external means* which offer the most advantages are, during the first or cold stage, or that of horror and invasion, the warm bath, followed by frictions of the surface with warm olive oil, and sinapisms or turpentine embrocations over the epigastrium. When the period of excitement and vascular reaction has supervened, the hair should be removed from the head, and cold applications, or the cold affusion be prescribed, and repeated or continued according to circumstances. The tepid bath, or cold sponging of the whole surface, is generally as beneficial as it is grateful to the patient in this stage; and when either the one or the other is followed by frictions of sweet oil, a copious and general perspiration usually supervenes, and proves critical, especially when aided by the warm sudorifics, particularly the liquor ammoniæ acetatis, spiritus ammoniæ aromaticus, and the æther hydrochloricus, or spiritus ætheris nitrici, as advised above (§ 164.). In the last stage, and even early in the fourth form of the distemper, the external applications should be of a different kind from those required in the second stage. Warm and rubefacient substances are now required, the same means as are advised in another part of this article being also the most appropriate in these states of the distemper. (See PESTILENCE, CHOLERIC, §§ 179, 180.)

186. *H. During convalescence* the utmost care is requisite to prevent a relapse, especially into that state of dangerous exhaustion or depression marking the third stage and the fourth form of the malady; a relapse being the more to be dreaded the earlier the period of convalescence, and the more liable to occur when the patient has been rescued from sinking by recourse to powerful stimulants and restoratives; for in these cases the too early suspension of these remedies allows the distemper to resume that course which had been arrested only for a short time by their aid; for if they be altogether or even partially relinquished before the secretions and excretions are restored, and the condition of the blood very materially improved, the disease returns, the morbid actions characterising it being only suspended for a while under the influence of the agents which had been administered. When convalescence is further advanced, the distemper having altogether ceased, recovery generally takes place more or less rapidly without any disposition to relapse, unless errors of diet, excesses, or most injurious exposure to noxious influences have occurred; and even in these cases it is doubtful whether or not the consecutive disease is the same as that from which the patient had recovered; for it must be obvious that a patient convalescent from this distemper cannot be exempt from the operation of malaria, or of other causes of disease, but on the contrary more likely to be affected when exposed to them, owing to existing debility and impaired resistance of vital power to injurious agents. During convalescence from this as well as from other pestilential maladies, very nearly the same measures may be adopted as have been advised in another place, with such modifications as the circumstances of particular cases may suggest. (See PESTILENCE, CHOLERIC, §§ 215—217.)

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Quarantine Laws, 8vo. Albany, 1846. This able report, kindly forwarded by Dr. P S. TOWNSEND, of New York, reached me as this was passing through the press. It contains the evidence of the most eminent physicians in the city, and numerous facts, fully confirming the views entertained in the preceding article. It is most satisfactory to have so important and convincing a body of evidence as this report contains, so opportunely furnished, although too late to aid in my labours.

PESTILENCE, SEPTIC. — SYN: — *Pestilentia Septica*, Author.— *Pestis* (from pasco, pastum, quod depascatur artus; *or from* pessum, quod pessum det); *Pestis Septica; Pestis glandulosa; P. Adeno septica* (from Σήπω, putrefacio; Σηπτὸς, σηπτικὸς, septic, putrid, liquescent, &c.); — Λοιμος, Hipp.; Galen: — Λοιμωδης πυρετος, Auct. Græc.; — Λοιμὸς σηπτικὸς; — *Pestilentia*, Celsus, Pliny, Cicero; — *Pestis*, Auct. Var.; — *Pestis Orientalis*, Auct.; — *Typhus Pestilentialis*; — *T. Gravissimus*; — *T. Anthracicus*; — *T. Bubonicus*; — *Febris Pestilentialis, &c.*, Auct. Var.; — *Typhus Pestis*, Young; — *Anthracia Pestis*, Good; — *Exanthema Pestis*, Parr; — *Loimopyra*, Swediaur; — *Pestis Acutissima*; — *P. Inquinaria*; — *Pestilitas*; — *Ephemera Pestilentialis*; — *E. Mortifera*; — *Febris Adeno-Nervosa*, Pinel; — *Peste, Pestilence, Fièvre pestilentielle*, Fr.; — *Pest, Plage, Pestfieber, Pestilienz*, Germ; — *Pest, Pestilents*, Dan. Swed.; — *Peste, Pestilenza*, Ital.; — *Plague, Pest, Pestilence, Levant Plague, Septic or glandular Pestilence, &c.*

CLASSIF.—Same as CHOLERIC AND HÆMAGASTRIC PESTILENCES.

1. DEFINIT.— i. NOSOLOGICAL. — *After chills, rigors, or horrors, nausea, and vomiting, with vertigo, headache, or stupefaction, and fever; sense of heat or burning at the præcordia; rapid, weak, irregular, or intermitting pulse; and carbuncles, buboes, spots, pustules, or petechiæ of various colours distributed in different parts of the body.*

2. ii. PATHOLOGICAL. *An animal poison or miasm specifically affecting the nervous and vascular systems—the circulating fluids, vessels, and glands, and remarkably impairing, and very frequently entirely subverting, vital resistance and the cohesion of the tissues.*

3. Annihilation of vital resistance and of the cohesion of the tissues characterises more or less all severe cases of pestilence, and all malignant febrile diseases. The causes which occasion them — specific animal poisons — exert a manifest septic influence; manifest at least in their results, however the powers of life, in their resistance to the noxious causes which have invaded them, may give rise to various modes of reaction, or attempts at reaction, and ultimately either throw off the destructive agencies, or sink beneath them. But the virulence of the poison occasioning the plague, and the septic or life-dissolving influence it exerts, as evinced by the spots, by the carbuncles, by the sphacelations of portions of the cutaneous, adipose and cellular tissues, by the softening of the internal viscera, and by the diffluent or softened state of the lymphatic glands and surrounding structures found immediately after death, are remarkably so, especially where this pestilence is epidemic, that I have thought that these malignant properties, as being the most characteristic and the most generally present, should furnish the specific designation of the distemper. I have, therefore, used the word *septic* in the sense usually attached to it, to mark this tendency to vital dissolution and its actual consequences in this pestilence, as being perhaps the most appropriate, as marking the chief disposition and pathological conditions — the remarkable malignancy of the fully developed distemper. It may not be approved by many, as not indicating the states of nervous power and vascular action characterising the attempts made by the nervous and vascular systems under the influence of life, to resist the exterminating influence of the poison which has infected them; and I cannot say that it quite pleases myself; but I am anxious to avoid, on this occasion, as I have hitherto avoided, the introduction of new and foreign terms into this work. I shall, however, adopt any one that is unquestionably better, if the objectors will furnish it; but the topic will be discussed more fully hereafter.

4. There can be no doubt of this pestilence having appeared at various epochs as remote as history has furnished the records, in several countries bordering on the Mediterranean, and especially in Egypt. The sacred books of the Old Testament, and the writings of HIPPOCRATES, ARETÆUS, and GALEN furnish notices of pestilences, which may be considered as more applicable to this than to any other species. Still they give no description sufficient to enable us to decide positively as to their identity with that now under consideration. The earliest notice strictly applicable to this distemper to be found in the writings of the ancients is that by RUFUS, preserved in an inedited book of ORIBASIUS, and to which reference is made by M. LITTRE, in his edition of *Hippocrates*, and in his article on the plague in the *Dictionaire de Medicine*. RUFUS describes buboes as appearing in the neck, arm-pits, and thighs, and as being either with or without fever. But the buboes called *pestilential*, he states, are the most acute and the most dangerous. Such as are seen especially in Lybia, Egypt, and Syria; and of which DENYS, surnamed KYRTUS, has made mention. DIOSCORIDES and POSIDONIUS, he adds, have concerned themselves chiefly with the pestilence which prevailed in Lybia. They state that in this plague there were acute fever, pain, and tension of the whole body, delirium, and the formation of buboes, which were hard and large, and which did not go on to suppuration. These buboes appeared not only in the usual places, but also in the hams and bends of the arms. (*Classicor. Auct. e Vaticanis Codicibus Edit.* curante A. MAIO, 8vo. Romæ, 1831, t. iv. p. 11.)

5. No further account need be taken of the brief notices of plague which are scattered through the works of the ancients, until we come to the description of the fatal epidemic by PROCOPIUS that depopulated the Roman empire in the reign of JUSTINIAN. An abstract of these notices will be found in Mr. ADAMS's translation of PAULUS ÆGINETA (vol. i. p. 279.). The pestilence which prevailed in the reign of JUSTINIAN is also described by EVAGRIUS and AGATHIAS. It resembled the plague of Avignon, described by GUY DE CHAULIAC. According to PROCOPIUS, the usual precursors of an attack were disturbed dreams and various delirious fantasies; but the early symptoms were not well marked; for there was neither increased heat nor discoloration of the skin, nor did the patient apprehend danger. Generally on the first or second day, but in a few instances

somewhat later, buboes appeared not only in the groins, but also in the arm-pits and below the ears. Some were affected with deep coma, and others with wild delirium. Some died from sphacelus of the buboes, which, when inspected by the physicians after death, presented the appearance of an anthrax, or carbuncle. Some died at the commencement, and others after the lapse of several days. In certain cases, the skin was covered with black phlyctenæ, of the size of a lentil, which were usually succeeded by sudden death. Others were unexpectedly cut off by a discharge of blood. To women in the puerperal state it proved particularly fatal. When the buboes came to a proper suppuration, they generally proved a favourable crisis; but when they did not suppurate, they were commonly followed by a wasting of the thigh. One of the consequences of the distemper was an affection of the organs of speech. All the usual prognostics proved fallacious; and the effects of the common remedies were uncertain. In some cases the bath proved beneficial, and in others it had a contrary effect. The amount of deaths in Constantinople, at one time, was said, but probably with great exaggeration, to have ranged from five to ten thousand each day. (*De Bello Pers.* 22, 23., and ADAMS's *Comment. on* PAULUS ÆGINETA, vol. i. p. 281.) This plague appears to have very closely resembled the plague of London in 1665, as described by Dr. HODGES. My limits will not permit any notice of the descriptions of the septic or glandular pestilence contained in the writings of the Arabian physicians. The reader, however, will find a brief abstract of these descriptions, and of the treatment recommended by these writers, in the volume by Mr. ADAMS just referred to.

6. This pestilence has presented various grades of severity, malignancy, and prevalence, according to the several accounts which have been furnished by contemporary historians and physicians, since the days of AVICENNA and other Arabian writers; and even within our own memories, since the commencement of the present century, it has evinced different degrees of severity and prevalence, according as it has appeared in a sporadic or endemic, or in an epidemic form. In the countries of the Levant, and particularly in Egypt, the distemper occurs sporadically or endemically, or rather appears in isolated cases, without becoming epidemic, unless after periods or epochs of indefinite but of considerable duration. In more northerly climates, it has occurred only as a destructive epidemic, and then often without any manifest dependence upon season, time of the year, or weather, although a temperate or warm season has appeared to favour its malignancy and prevalence. During the middle ages, numerous epidemical visitations of this pestilence occurred in Europe, Africa, and Asia, not merely in the countries surrounding the Mediterranean, but also in others more or less remote from this sea. The most destructive outbreak, however, of this pestilence upon record is that which occurred near the middle of the fourteenth century.

7. This pestilence, usually denominated the *black death* or *black plague*, first appeared in China in 1333, when it was said to have destroyed more than one fourth of the population; and it thence proceeded gradually to the western countries of Asia, to those surrounding the Caspian Sea; to Arabia, Syria, and Egypt; and to the eastern and southern kingdoms of Europe. It reached Avignon in 1348, gradually extending northwards to France, Germany, England, Denmark, Russia, &c. It invaded Russia in 1350; and there, as well as in other northern countries, it proved nearly as destructive as in southern climates. It appeared first in the southern counties of England, and gradually proceeded northwards; and in this, as well as in other countries, was most remarkably destructive in the large, close, and crowded cities and towns. It did not altogether cease in some places, or it continued to recur after intervals, until 1360 or 1361, when it seems to have entirely disappeared. Dr. HECKER has collected from numerous sources much information concerning this pestilence. He states that it was an oriental plague, marked by boils and tumours of the glands, such as break out in no other febrile disease. From these boils or buboes, and from the black spots and carbuncles indicatory of a putrid decomposition which appeared in the surface, it was called, in the northern countries of Europe, the black death; and in Italy and other southern countries, the great mortality, or great plague.

8. According to GUY DE CHAULIAC, the victims of this plague were frequently attacked with an ardent fever attended by discharges of blood, which proved fatal in three days. Buboes and and boils did not come out at first, but a carbuncular affection of the lungs often occasioned the destruction of life before the external symptoms were developed. He adds, that "the plague thus raged in Avignon for six or eight weeks, and the pestilential breath of the sick, who expectorated blood, caused a terrible contagion far and near; for even the vicinity of those who were affected was certain death; so that parents abandoned their infected children, and all the ties of kindred were dissolved. After this period, buboes in the axilla and in the groin, and boils over the body made their appearance; but it was not until seven months afterwards that some patients recovered with buboes as in the ordinary milder form of plague." (*Tract.* ii. c. 5. p. 113.) This pestilence appeared in a similar manner in Egypt, destroying quickly with burning heat and expectoration of blood.

9. BOCCACCIO makes no mention of the first appearance of this pestilence in China, and of its progress westwards, but remarks that "this most terrible plague happened in Florence in 1348, that it had broken out some years before in the Levant, and that after passing from place to place, and making incredible havoc all the way, it had now reached the west." It began to show itself in the spring of the year, "in a sad and wonderful manner; and different from what it had been in the east, where bleeding at the nose was the fatal prognostic; here there appeared certain tumours in the groin or in the arm-pits, some as big as a small apple, others as an egg; and afterwards purple spots in most parts of the body; in some cases large and but few in number, in others less and more numerous, both sorts the usual messengers of death." (*Decameron*, Giorn. i. *Introd.*)

10. The same phenomena were remarked in this pestilence as it occurred in Germany, France, Norway, and Russia, and the most prominent amongst these were the infallible signs of the oriental or glandular plague. But in different

countries certain symptoms appeared more prominently than others, or perhaps were more particularly noted by contemporary or subsequent chroniclers. In France many were struck as if by lightning, and died on the spot, and this more frequently among the young and strong than the old; and the patients with buboes scarcely survived two or three days. In England the distemper was attended, as at Avignon, with spitting of blood, buboes, and carbuncles. In Norway and Poland spitting and vomiting of blood are stated to have occurred in addition to the characteristic signs. In Russia the distemper was said to have commenced with rigors, heat, and darting pains, to have been attended by spitting of blood, and to have terminated fatally in two or at most three days. It was chiefly when the spitting of blood had continued for some time that buboes and carbuncles appeared.

11. Dr. HECKER remarks that all the descriptions of this most remarkable pestilence which have come down to us contain, with a few important exceptions, all the symptoms of the true plague as observed in modern times. No doubt can obtain on this point. The facts are placed clearly before our eyes. We must, however, bear in mind that this distemper does not always appear in the same form; and that while the essence of the poison which it produces, and which is separated so abundantly from the body of the patient, remains unchanged, it is proteiform in its varieties, from the almost imperceptible vesicle, unaccompanied by fever, which exists for some time before it extends its poison inwardly, and then excites fever and buboes, to the fatal form, in which carbuncular or gangrenous inflammations affect the most important viscera, as appeared to have been the case in a large proportion of cases of this pestilence.

12. The hæmorrhages which were so frequently remarked, in various countries where this pestilence prevailed, and soon occasioned death, were obviously the result of the vital dissolution of the structures and of the crasis of the blood; the inflammations said to have existed being a state of asthenic vascular congestion with sanguineous exudations, or inflammation of a gangrenous nature, owing to the rapid loss of the vital power of the capillaries. That such was the case in a remarkable degree, as respected the capillaries, the tissues, and the blood itself, was evinced by the rapid discoloration, the purplish hue, and the loss of sensibility of the affected parts. There was a loss of vital cohesion throughout the whole frame, those tissues and structures, as the mucous, the cellular, the glandular, and the parenchymatous, that possess the least density, and the capillaries supplying them most rapidly and most completely undergoing this septic alteration.

13. The plague, which devastated the empire of Morocco in 1799 and 1800, appears to have been equally virulent with the above, but much more circumscribed in its spread. Mr. JACKSON, who resided in that country during its continuance, has described it as it came under his own observation. He states that Terodant, the metropolis of a province, lost above eight hundred each day, during the height of the pestilence; the city of Morocco lost upwards of one thousand daily; and that old and new Fez, about fifteen hundred daily. Young, healthy, and robust persons were for the most part attacked first, then women and children, and lastly thin, sickly, emaciated, and old people.—The *symptoms* of this plague varied in different persons with age, constitution, and habit of body. "It attacked some with a sudden and violent shivering, others with a sudden delirium, succeeded by unquenchable thirst. Cold water was eagerly resorted to by the unwary, and proved fatal to those who indulged in its momentary relief. Some had one, two, or more buboes, which formed and became as large as a walnut in the course of a day; others had a similar number of carbuncles; others had both buboes and carbuncles, which generally appeared in the groin, under the arm, or near the breast. Those who were affected with shivering, having no bubo, carbuncle, spots, or any other external disfiguration, were invariably carried off in less than twenty-four hours, and *the body became quickly putrified*, so that it was indispensably necessary to bury it a few hours after dissolution."* (p. 273.)

14. The plague of London in 1665, or the Great plague, of which, according to Dr. HODGES, upwards of 100,000 persons died, presented the phenomena already noticed variously grouped. This writer remarks that this pestilence puts on various or even different appearances, according to the constitution and age of the patient, the season of the year, the modes of living, the preceding and present distempers, and the virulence or de-

* The following brief notices of cases will illustrate the characters and nature of the pestilence.—1. M. A. fell suddenly down in the street, and was conveyed home. Three carbuncles and five buboes appeared the same day, in the groin, under the joint of the knee, in the armpits, and inside of the elbow, and he died three hours afterwards.

2. L. R. was suddenly smitten when following his avocations, and fell down. He described a sensation similar to that produced by running needles into the parts; and in the situations where this was felt carbuncles afterwards appeared. He died the same day.

3. Mr. Jackson's cook appeared in good health and spirits; but in half an hour afterwards he came to the room door with his eyes starting from his head, and his bed-clothes in his hands, saying "Open the gate for me, for I am smitten." The next morning he came to the gate half dressed, saying that he was quite recovered. He was not admitted; and accordingly returned to his apartments and expired the same evening, about twenty-four hours after his seizure; and before daybreak his body was in such a deplorable state that his feet were quite putrified. His wife was soon afterwards seized, but recovered.

4. H. ben A. was smitten suddenly, and felt at the time as if two musket-balls had passed through his groins. A giddiness and delirium followed; and immediately afterwards a green vomiting, and he fell senseless to the ground. A short time subsequently buboes formed in the places where he felt as if shot; and on suppurating, discharged a fetid black pus. A carbuncle in the bend of the arm was full of a thin ichor contained in an elevated vesicle, and surrounded by a burning red areola. He ultimately recovered.

Mr. JACKSON remarks, that those who had vomitings of green or yellow bile generally recovered after suffering in various degrees; but that those who were affected with giddiness or delirium, followed by vomiting of black bile, invariably died after lingering one, two, or three days, their bodies being covered with small black spots similar to grains of gunpowder. In this state, however, they possessed their intellects until their dissolution. He adds, that when the constitution was unable to throw the poison to the surface in the form of buboes, carbuncles, boils, or blackish spots, "the virulence seemed to have acted inwardly, or on vital parts, and the patient usually died in less than twenty-four hours;" and that, when the carbuncles or buboes had a blackish circle round their basis, the case was invariably fatal. "Sometimes the whole body was covered with black spots like partridge-shot. Such patients always fell victims; and those who felt the blow internally did not survive more than a few hours.' (p. 238. 4.)

gree of infection. Dr. HODGES practised in London during the continuance of this plague; and, notwithstanding the admixture of the prevailing pathological notions of the day with his description of the symptoms, has given a very instructive account of them. He *first* states "*the manifest signs of infection*," and afterwards describes "*the appearances after infection*." The manifest signs of infection he states to be horror, vomiting, dizziness, delirium, headach, and stupefaction. The appearances after infection are fever, watching, palpitation of the heart, bleeding at the nose, and great heat about the præcordia, all which may occur in other pestilences, but in this they are conjoined with *those which are peculiar to it*, as pustules, commonly called blains, buboes, carbuncles, spots, marks, or tokens. (*Loimologia*, p. 86, *et seq.*)

15. Septic pestilence, which had become much less prevalent for several generations after the black plague of the fourteenth century, again devastated many countries in the sixteenth century, as shown in the writings of LANGIUS, VALLERIOLA, SCHENCK, JOUBERT, PALMARIUS, INGRASSIAS, and others. In the following century, also, it prevailed in various countries of Western Europe; and, although limited chiefly to large and commercial cities, it was most destructive in those places; as fully shown by the writings of DIEMERBROECK, HODGES, DE FOE, and many others. During the last century, this plague became even more generally epidemic than in the 17th, and invaded most of the countries of Europe, some of them far remote from those to which it was commonly confined. Of these pestilences full details are to be found in the works of CHENOT, SCHRAUD, DE MÆRTENS, MINDERER, SAMOILOWICZ, RUSSELL, and others.

16. I. SYMPTOMS. — There are few distempers in which the symptoms are so diversified as in the pestilence now being considered. The severity of the attack, resulting from the intensity of the cause, or dose of the poison, relatively to the susceptibility of the patient; the age, habit of body, and temperament of the person attacked; the severity or character of the prevailing epidemic; and the various circumstances influencing the patient at the time of seizure or during the continuance of the malady, tend to modify the phenomena in a more or less remarkable manner. DIEMERBROECK has given a very succinct view of the symptoms of this pestilence, and of the diversities they present, and which I shall here exhibit with but little alteration. Fever, jactitation, extreme anxiety, frequently a remarkable internal heat, dull or gravative pains in the head, rarely acute; terror, horror, or delirium, convulsive startings of the tendons, or slight contractions of the limbs; in some continual watchfulness, in others an overwhelming somnolency; a restless expression of countenance, noises in the ears, and in some deafness; a dry but rarely a black tongue; great fœtor of the breath and of the perspiration; leipothymia or syncope; the pulse sometimes almost natural or full, but most frequently rapid, feeble, unequal, or even intermittent, in many very small, rapid, equal, or irregular; a short or dry cough, sometimes hæmoptysis; thirst, loss of appetite, pain at the epigastrium and cardiac orifice of the stomach, nausea, vomitings, hiccup; crude alvine evacuations, remarkably offensive, sometimes containing worms, occasionally an exhausting diarrhœa; the urine often almost natural and depositing a settlement, in many high-coloured and scanty, in others crude and turbid, in some sanguineolent, and generally very different in the course of the distemper, or even in the course of the day; sudden prostration of strength, and incapability of motion from the commencement in some, in others but little impairment of power until the moment of dissolution; the heat of skin sometimes acrid and increased, sometimes natural or even reduced; the colour of the countenance either pale or reddened, or somewhat livid, or even natural; purple, violet-coloured, black, or red spots on different parts of the body, sometimes in small numbers, in others in great numbers, and either large or small, but always round, occasionally seen chiefly in certain parts of the body, but confined to no one part in particular, and often scattered over the whole surface; tumours or buboes in the groins, armpits, neck, &c.; carbuncles in different parts of the body, &c. These symptoms are generally not all present in one case; but many of them occur in one, and the rest in others. During the epidemic prevalence of plague in various countries, the symptoms have presented several grades or states, most probably owing to the causes just assigned. These grades or states have been described by several writers of the last century, and their descriptions have been confirmed by those of the present day. I shall first notice these grades, and afterwards the several stages in which the progress of the distemper may be divided.

17. i. GRADES OR STATES. — CHICOYNEAU, VERNO, SOULIER, and others have noticed five grades or states of this pestilence; and which they have described nearly as follows: — 1st *Grade*. This, the most *intense form* of plague, is observed chiefly at the commencement and during the early course of an epidemic, and consists of all those cases in which the symptoms are most severe, and are most promptly followed by death. The patient is attacked by irregular chills or rigors, or a feeling of general cold, a very small, soft, slow or frequent, unequal or irregular pulse; by a heavy pain in the head, with a stunning, vertiginous feeling; and by a stupid, muddled, or drunken appearance. The countenance seems fixed, or vacant and apathetic, or presents a look of alarm or despair. The speech is slow, hesitating, plaintive, or interrupted; the tongue is white and afterwards dry, red, black, and rough; the face is pale, or of a leaden hue, or cadaverous; the contractions of the heart are very frequent; the spirits are remarkably depressed; faintness or syncope, vomitings, retchings, great restlessness, distressing anxiety, &c., are frequent, and terminate existence. Persons thus attacked often sink in the course of a few hours, sometimes almost suddenly, or in the course of a night; frequently within twenty-four hours; and seldom survive longer than thirty-six or forty-eight hours; the powers of life sinking lower and lower, without being able to make any resistance. Frequently tremors, or slight convulsive movements occur at intervals; but none of the external signs, tumours or eruptions characteristic of the pestilence appear; the powers of life being insufficient to throw them out on the surface.

18. *B. Second Grade.* This grade generally

commences, as the foregoing, with chills or rigors, and with a similar affection of the head; but these symptoms are followed by some evidence of vascular reaction. The pulse becomes frequent, open, quick, expansive, but remarkably soft and compressible. The patient complains of burning heat internally, whilst the external temperature is either natural or but little augmented. Thirst is unquenchable; the tongue is white, or reddish brown, or dusky red; speech is hurried, or impetuous or stammering; the eyes are suffused, fixed, or wild, and bright; the countenance is reddish or slightly livid; respiration is frequent, laboured, or large and slow, but without cough or pain; nausea is common, with vomitings of bilious, greenish, black, or bloody matters, similar matters being passed by the bowels, without tension or pain; the urine is sometimes natural, sometimes turbid, or pale, at other times black or sanguineolent; and the perspirations are offensive, and instead of relieving, merely enfeeble the patient. In some cases hæmorrhages from mucous canals take place, and produce fatal depression. Wandering or phrenitic delirium is common; and when the patient is rational, there are great depression and apprehension of immediate dissolution; nothing tending to rally his spirits, or to re-assure his confidence. In this grade, the characteristic signs always appear from the commencement, or in the course of the distemper. Painful tumours or buboes occur in the groins or a little below them, in the arm-pits, or beneath the ears or lower maxilla, or neck; as well as carbuncles chiefly in the arms and thighs, but sometimes also in other parts; and frequently pustules of a whitish, pale, or livid, black and carbuncular appearance, or purple spots spread over the surface of the body. Recovery rarely takes place from this state of the pestilence, although death does not occur so quickly as in the foregoing. Nearly all those attacked seem to be carried off by a rapid sphacelation of the parts chiefly affected, extending even to the thoracic and abdominal viscera. It is singular that this form of the disease is met with principally in the fat, robust and plethoric; and the more these conditions are remarkable, the less is the chance of recovery.

19. *C. The third form* or class of cases, comprises the two former; for the writers on the plague of Marseilles, observed during the whole course of the pestilence, numerous cases which presented in succession several symptoms referable to both the foregoing grades; so that most of the signs characterising the second were the precursors of those attending the first form, which always indicated the rapid extinction of life. In these, the buboes receded; and if carbuncles had advanced, they rapidly assumed a more extended and gangrenous form.

20. *D. The fourth state* or class of cases, consists of those attacked with the same symptoms as are noticed in the second grade (§ 18.), but these symptoms abate more or less on the second or third day, either spontaneously or from the effects of treatment, and almost always owing to a considerable eruption of buboes and carbuncles which seem to have concentrated the morbid leaven, and which, proceeding on towards suppuration, in this way procure the recovery of the patient.

21. *E. The fifth grade* or class of cases comprises all those in which there are no febrile or other disorder, or but very slight disturbance, but which present buboes or carbuncles, or both, that either go on to suppuration, or become hard or chronic, or are more rarely resolved without occasioning any unfavourable result. Thus there were seen at Marseilles a number of persons of both sexes who went abroad, lived as usual, and experienced but little or no impairment of strength, and yet were affected with buboes and carbuncles, or with one or other.

22. *a.* M. Gosse, one of the most recent writers on the plague, and who saw the disease during its prevalence in Greece in 1827 and 1828, furnishes some interesting particulars as to its history. He remarks that the contagion produces a form of the distemper which, as respects the primary local symptoms, very closely resembles *malignant pustule*, or anthrax: this is the *carbuncle*. First, there appears in some part of the skin, but especially on the limbs, the arms or neck, a small brownish spot, like a flea-bite, attended by an itching and smarting, and afterwards by a burning heat. This spot increases to the diameter of three or four lines, assumes a violet hue, and is covered by a flattened vesicle or phlyctena formed of the detached epidermis. The base is hard, and swollen like that of a boil. In a short time the central part assumes a bluish black appearance, and the margins, as they diverge from the centre, form concentric circles of a violet tinge, then a dark purple, a bright purple, &c., or they assume an erysipelatous appearance. The black centre extends rapidly, as well as the surrounding areola. When this *carbuncular pustule* has reached the extent of an inch and a half in diameter, it generally about the third day continues for a short time stationary. In some rare instances vascular reaction is developed around the gangrenous centre, an inflammatory circle is formed between the living and dead parts, suppuration takes place with symptomatic fever, and detaches the central slough, and the disease terminates. But much more frequently inflammatory action is either not established around the gangrened part, or if it exist it is insufficient to separate or throw off the slough; absorption takes place, and the poisonous fluid of the part is absorbed, contaminating and inflaming the lymphatic vessels and glands, so that red lines may be traced from the carbuncles to the glands through which these vessels pass; these glands rapidly becoming most painful and swollen. When the patient is robust, and the case proceeds favourably, the glandular enlargement increases rapidly, and the pains in the glands are acute and lancinating. The *buboes* thus formed tend rapidly to suppuration, with moderate symptomatic fever; and if the patient is guilty of no imprudence in diet or otherwise, and if his vitality is sustained, the suppuration proceeds favourably. Whilst the buboes are developed the carbuncles extend, the gangrenous portion or central slough tends to separate from the surrounding inflamed tissue, suppuration is established, and the central slough is detached, leaving a deep wound, which is often slowly healed. In some cases the slough thus detached is very large. When suppuration takes place in the buboes recovery generally follows; but if

the patient be weakened by any cause, or be depressed by cold, by mental anxiety, or disordered by indigestible food; if a temporary swelling of the glands merely occurs, the tumour disappearing without passing on to inflammation or suppuration; if, especially, no buboe follows a carbuncle which has not suppurated, the constitutional symptoms assume the worst form, and soon pass into dissolution.

23. *b.* The *other form* of plague, according to M. GOSSE, instead of presenting the local or external symptoms as the primary and prominent phenomena, manifests intense affection of the whole system from the commencement. Chills or rigors, with acute frontal headach, noises in the ears, vertigo, or a stunning sensation or confusion in the head, are first complained of. A sensation resembling sea-sickness is often felt, and these are generally followed by all the worst symptoms mentioned when describing the first and second grades of the distemper (§ 17, 18.)

24. *c.* DE MERTENS describes the *carbuncle* of the plague to be a gangrenous spot in the skin, resembling that caused by a burn. It consists of a reddish spot covered by small vesicles, which are pale, livid, or black, and surrounded by an inflamed circle; and passing quickly into a black, hard eschar. The term *anthrax*, he states, is usually applied to a sore resembling the carbuncle, but is larger and more elevated. It penetrates deeper, and is surrounded by pain and inflammation. Carbuncles are found on the neck, on the cheeks, the chest, the back, and the extremities, sometimes even on the buboes. The anthrax is seen chiefly on the neck and back. Carbuncles sometimes appear without buboes; frequently they accompany these swellings of the glands, or even occur later than they. M. AUBERT remarks that carbuncles rarely appear alone, but are generally followed or preceded by buboes; and that the plague, termed carbuncular, is not the more dangerous, especially if the carbuncle is solitary. He adds that the largest carbuncle which he has seen was on the middle of the back, and was four inches in diameter; the cicatrisation of it was very slow. He has met with as many as eleven carbuncles in the same case; and with an instance of a pregnant female, who died of the plague, having a carbuncle on the breast. She was delivered of an infant of seven months during her illness, and it had a carbuncle on its forehead.

25. *d.* The *petechiæ*, which are seen in plague, are stated by DE MERTENS, AUBERT, and others, to be a most unfavourable symptom, and to occur chiefly at an advanced period, or shortly before dissolution. M. AUBERT, however, remarks that he has seen recoveries after the appearance of petechiæ. They are always in this pestilence round, purplish, or black, varying from an almost imperceptibly small point to the diameter of two lines; and are found on all parts of the external surface of the body as well as on the internal surfaces. — *Ecchymoses* more immediately precede death; and proceed from effusions of blood of greater or less extent in the cellular tissue and membranes, owing to loss of the vital cohesion of the capillaries and tissues, and of the crasis of the blood. — HODGES, MOREA, and others, mention certain eruptions, *marks*, or *tokens*, which are very different from petechiæ or the furuncular pustules now described. They are small tubercles, somewhat resembling warts, callous, and more or less deficient in sensibility; varying in size from that of a millet seed to that of a bean. They are probably merely a modification of the early stage of carbuncles, in the more unfavourable cases.

26. *e. Various modifications* of the symptoms are observed during the prevalence of this pestilence. HODGES mentions cases of persons who walked about, or presented the appearance of health, and partook of their usual meals, and yet had the most unfavourable signs of the distemper in various parts of the surface, death taking place in a few hours. Some became delirious immediately after being seized, and wandered about until they fell down exhausted and dying. In the plague of Noja, it was observed by MOREA, that when buboes appeared in the neck, especially near the carotids, the eye on the same side as that presenting the buboes became inflamed and ultimately destroyed. RENSA states that he has seen persons so little affected by the disease, as to walk about, to eat and drink as usual, and to dress their own buboes. Those who have been already affected by the pestilence, generally escape during subsequent epidemics, or experience in rare instances a modified attack, or merely pains in the cicatrices of old sores and buboes.

27. *f. A secondary and modified attack of plague* is occasionally met with, although a person who has been once infected is generally secure against a second seizure. M. GOSSE states, that, in Turkey and Greece, those who had been already attacked and who presented the cicatrices of buboes or carbuncles, were employed in preference to others as attendants on the sick; and that although they took no precautions in waiting upon the infected, slept and ate near to them, handled their clothes and persons, and interred them after death — although exposed to the influence of infection in its full intensity, they generally escaped a second attack of the distemper. Many of them, however, experienced pains in the cicatrices of the old buboes without any other ailment. A few complained during a subsequent epidemic of headach or vertigo, or disorder of the stomach and general debility. Others had slight enlargement of the glands in addition to these symptoms; and but very rarely new carbuncles or sores appeared. M. GOSSE mentions only one case in which the second attack was so severe as to terminate fatally. This person had been much exposed to the effluvium proceeding from the fœtid evacuations of the sick, upon whom he was an attendant. He was soon after infected, and died on the sixth day of the disease.

28. ii. STAGES OR PERIODS. — Although this distemper may consist of only *one stage*, in its most aggravated cases; that one being characterised by rapid sinking of the powers of life as manifested by the nervous and vascular systems and internal organs, still it much more frequently exhibits the several periods into which febrile, exanthematous, or other diseases attended by vascular reaction, have been usually divided. These periods have been variously divided; but they may be described as follows, and as they appear in the majority of cases.

29. *A.* The *period* which elapses between the first impression of the exciting cause, and the actual manifestation or irruption of the symptoms of

plague has been differently estimated by different writers. The *duration* of this period obviously depends upon the intensity of the cause, relatively to the susceptibility of the patient—upon the dose of the poison infecting the individual. During devastating epidemics, when it may be presumed that the infectious agent or poison exists in its greatest intensity, and when its activity is augmented by an increased susceptibility of infection amongst the great majority of the community, this agent produces its effects with more or less rapidity. In some instances where it may be presumed that the morbid effluvia from the bodies of the dead, or evacuations of the diseased, have been more than usually abundant, the effect upon those very nearly exposed to them has been most depressing, and almost instantly overwhelming to the powers of life. Many writers have mentioned the seizure of persons thus circumstanced as suddenly as if they had been struck by lightning, vital exhaustion proceeding most rapidly, with a feeling of the utmost internal anxiety and distress, and terminating in fatal sinking in an hour or two. In these cases, and even in many of much longer duration, the malady admits not of any division into *stages* or *periods*, these having, in fact, consisted of only one stage, namely, that of progressive exhaustion of the powers of life, following immediately after the impression of the exciting cause, and terminating fatally with great yet variable rapidity. In these, as there is no variation in the course of the distemper, so there can be no division of it into stages; and there is also no *latent period* between the impression made by the poisonous agent and the manifestation of its effects—no period for the incubation of the morbid seminium, the fatal results of which are rendered instantly apparent in such cases.

30. In different circumstances, however, and in the large majority of instances, the distemper requires a longer or shorter period from the time at which its cause has infected the system before its effects are apparent. This period, which has been denominated that of *incubation*, or the latest stage of the malady, cannot be said to exist in the circumstances just mentioned; and even in some of those which are now about to be considered, it is often of so short duration, as either to be entirely overlooked, or to attract but slight attention. In these, as well as in other cases, when the period between infection and the irruption of the distemper is much longer, the patient is not generally in sound health during the interval. Although no complaint may be made, and but little ailment is felt, still more or less of malaise, or lassitude, or slight disorder may be detected; at last, after a period varying from a few hours to several days, the *actual manifestation* of the distemper, inaccurately called the *period of invasion* by many writers, takes place, and the malady proceeds in its usual course. It is fully ascertained that the morbid phenomena may instantaneously follow the impression made by the poisonous effluvium upon the susceptible, when it is intense, relatively to the grade of susceptibility; and that they may follow at periods more remote from such impression; but the extreme duration of this period has not been precisely ascertained. Seven, eight, or nine days have been viewed by many as the longest period during which the infectious emanation operates its effects, in a silent or latent manner, in the frame of the recipient before it explodes in open disease. It is even possible that a longer period may sometimes be required, especially when the distemper is merely endemic or sporadic, when the dose of the infecting poison is weak relatively to the susceptibility of the recipient, or when the action of the poison is resisted by the constitution and circumstances of the patient. It is also obvious that, in this, as well as in all other infectious distempers, as will be shown more fully hereafter, persons whose susceptibility is by no means great may altogether escape, although very much exposed to infection, until some depressing agent or influence comes in aid, and determines the operation of the exciting or infecting cause, as I have more particularly explained in the article DISEASE (§ 61.).

31. *B. The period of irruption or invasion*, usually appears with a short chill or rigor, nausea, lassitude, vomiting, severe pain of the head and præcordia; continued anxiety, a sense of internal heat referred to the stomach and bowels; vertigo with a staggering walk and appearance of drunkenness. The spirits are depressed to a state of apathy; the features are pale, collapsed, sometimes turgid or bloated; the tongue is coated with a white mucous crust; thirst is urgent and constant; the skin dry and hot; and the pulse most variable, usually quick, but at one time weak, small, and irregular, at another more full and equal. The vertigo, headach, and drunken appearance of the countenance, soon pass into delirium with jactitation, restlessness, and tremor of the limbs and tendons, often passing into profound lethargy. Sometimes difficulty of breathing, pain, and oppression at the chest; hoarseness and cough; a sense of burning heat at the præcordia, and occasionally throughout the thorax; and, in some cases, slight expectoration of blood, or more copious hæmoptysis, are present from the commencement. These symptoms are often increased by the accession of vomiting, or of borborygmi, or meteorismus, or diarrhœa.

32. *C. The eruptive period* may occur after a few hours, or in the course of the second or third, or even the fourth day. After the rapid aggravation of the foregoing symptoms, stinging and lancinating pains are felt in parts of the surface, followed by the appearance of *carbuncles*, in the manner already described (§ 22.); and generally either subsequently or contemporaneously by tumours of the lymphatic glands, or *buboes* (§ 22.). These are developed with greater or less rapidity, and with an increase of all the constitutional symptoms, which present a more marked malignancy as they continue. The nervous systems of organic and animal life evince extreme depression and disturbance; and the vascular system remarkable loss of vital tone. The delirium is either furious, or resembles violent intoxication, or it sinks into a stupid muttering or typhomania, or into complete sopor. The face is lurid, or of an earthy or leaden hue; the eyes are watery, suffused, and the lacrymal carunculæ red and congested; the tongue is dark, contracted, dry, and tremulous, sometimes almost black; the voice is hoarse or altered; the speech rapid, hesitating, interrupted, or stammering; vomiting is constant, irrepressible, attended by hiccup, and the matters rejected have a putrid odour; the perspiration is cold, viscid, and most

offensive, and the surrounding air is sickening and fœtid. The carbuncles sphacelate; the buboes either subside or pass into an ichorous ulceration; petechiæ, vibices, or ecchymoses appear; subsultus tendinum and convulsive movements supervene; and the pulse becomes soft, weak, small, irregular, or intermittent; with faintness, sinking, deafness, and loss of sensibility. These symptoms, which are often variously grouped, differ but little from those of putro-adynamic and true typhus fevers, excepting in the appearance of carbuncles and buboes.

33. *D. The period of Crisis* supervenes; but the distemper may terminate fatally with the symptoms of vital depression, and of dissolution of the vital cohesion of the tissues, just mentioned, at any period from the second to the seventh day. When it proceeds so rapidly as to terminate in death on the second or third day, the stages of its course are generally but imperfectly marked, at least according to the division of them adopted by HILDENBRAND, and followed by NAUMANN. But when the attack is less severe, and when it is prolonged to the sixth or seventh day, a favourable change frequently occurs on the latter day. The pulse is fuller, more equal, and stronger; a general, warm, and copious perspiration breaks out; the sloughs of the carbuncles begin to separate, and the buboes assume a healthy suppuration. The alvine and urinary evacuations are also improved, although a crisis is more rarely indicated by them, than by the external surface and sores.

34. *E. The Decrement*, or cessation of the distemper is generally gradual and slow when the attack has been severe, and when the carbuncles and buboes have been large, open, and foul. When the disease has been milder the symptoms disappear more rapidly, a resolution of the buboes taking place without suppuration occurring; but in all cases where the buboes go on to the production of a morbid matter, either infiltrating the cellular tissue surrounding the diseased glands, or breaking externally, a healthy suppuration is requisite to returning health. Hence *convalescence* is more or less prolonged by the severity and extent of the external sores, as well as by the violence of the preceding constitutional affection, by the profound alteration and depression of the powers of life in all the vital organs, and by the conditions of the circulating fluids.

35. *F. The Duration* of an attack of plague varies from an hour or two to six or seven days in fatal cases. According to M. MOREA, death generally occurs before seven days. When recovery takes place, the suppuration and healing of the carbuncles and buboes greatly protract the distemper, at least the early period of convalescence from it. In slighter attacks, when no foul and open sores are formed, recovery is much more rapid, and the duration of the distemper is much shorter, but of an indefinite duration, under nine or eleven days, no precise period having been remarked.

36. II. APPEARANCES ON DISSECTION. — M. RIGAUD, lately physician to the European Hospital, at Alexandria, states the following to have been the results of his examination of the bodies of sixty-eight subjects of the plague. The exterior of the body when death has ensued rapidly and without any medical aid, is bluish and dark-violet, in large irregular patches, especially about the head, the neck, and upper extremities; the surface appearing as if rubbed over with mulberries. This discoloration, which is often absent when death has taken place slowly, is accompanied with petechiæ, varying in size from a flea-bite to that of a vetch. One or more carbuncles and buboes are found in the situations already specified (§ 22.) The usual cadaveric stiffness is present.—*a*. The membranes of the *brain* are injected with black blood. The vessels beneath the arachnoid are greatly distended. This membrane is, however, rarely thickened; it is mostly adherent, by a buffy and granular transudation, to the upper and inner parts of the hemispheres of the brain. Sanguineous effusions are observed in some cases; but more frequently the cellular sub-arachnoid tissue is infiltrated with a serous fluid, sometimes yellow, or even purulent-looking. The cineritious substance of the brain is of a deeper colour than natural; and the white substance, when sliced, shows very numerous bloody points. A little limpid serum is found in the ventricles. The choroid plexuses are of a reddish violet colour, like the lees of wine. The brain is seldom softened. The membranes and substance of the spinal chord are generally in the same state as those of the brain. The cephalo-spinal fluid is in excessive quantity.

37. *b*. The *lungs* are generally found more or less altered, but the lesions are often consequences of antecedent maladies. They are often rose-coloured on their exterior and anterior surface; but sometimes pale yellow, marbled with blue; these appearances are, however, seen only when they are bloodless. Posteriorly they are always of a deep violet; their vessels being gorged with black and thick blood. The *pleura* is always of a dark red, with numerous adhesions. Effusions of a yellowish serum in considerable quantity are frequently met with in the pleural cavities. The *pericardium* usually contains from half a pint to a pint and upwards of serum. The *heart* seems increased in volume, and its superficial vessels are congested and well defined. Spots like petechiæ are observed over the left cavities. The right cavities, the auricles especially, are distended by black blood, sometimes clotted, but always gluey. On the left side, the cavities are empty, with the exception of a very little blood in the ventricle. The substance of the heart and its inner membrane are unaltered. The *arteries* are always empty; the *veins* are, on the contrary, distended, and full of black clotted blood, the jugulars more particularly. While the inner coat of the arteries presents no alteration, that of the veins is spotted largely and irregularly as if with ink.

38. *c*. The *pharynx* and *œsophagus* are commonly natural; and this has been the case even with the latter, when appearances of intense inflammation have existed in the cardiac orifice of the stomach. The *peritoneum* is always of a pink or bright red tinge; and the vessels are seen beneath it largely gorged with black blood.. The adipose tissue is injected and reddened, sometimes darkish like lees of wine. The *stomach* is often distended by gas. It frequently contains a quantity of a dark viscid fluid, like a mixture of bile and putrid blood. The mucous membrane varies in colour, from pink and bright red, to a brown,

bluish, or leaden tinge, and often to a bronze green. Large ecchymosed patches, and petechial spots are also observed in the internal surface. The internal coats are remarkably softened and sometimes ulcerated. The *intestines* present the same changes as the stomach, excepting the colon, which is somewhat contracted. Lumbrici, and less frequently, tæniæ, are found in many cases. The *mesenteric glands* are engorged and blackish; and the whole *glandular system* is more or less altered. The *liver* is almost always enlarged, especially its large lobe, which presses up the diaphragm very much on the right lung. Its vessels are engorged; its substance somewhat softened, but not otherwise altered. The *gall bladder* is double or nearly triple its usual size, containing a thick, greenish-black bile. Petechial spots are seen beneath its peritoneal covering. The *spleen* is much augmented in volume, softened, friable, and pulpy. The *kidneys* are engorged with blood; the ureters are arborescent, with a red hue along their entire course, or covered with black spots, or even wholly blackened, as if with charcoal or ink. The *urinary bladder* is commonly half contracted, and its inner membrane presents the same appearances as those of the stomach and intestines.

39. *d.* These changes were observed in Europeans who had died in the hospital in Alexandria, and who had been addicted to every kind of excess; but they differ but little from those found by other physicians who have observed the disease in various countries and epidemics. Petechiæ have been remarked in all the viscera, especially in the mucous surface, where also ecchymoses, and large dark spots have also been very common. The carbuncles said to have been found, by the older writers on this pestilence, in the abdominal and thoracic organs, have manifestly been those large ecchymoses or exudations of blood in the tissues, more accurately observed by recent writers. M. LACHAISE, in his description of the changes in the bodies of those who died of the Egyptian plague of 1835, states, that the whole lymphatic glandular system was diseased, internal as well as external. These glands were more or less engorged, enlarged, often softened and discoloured. The spleen was always very much enlarged, and so remarkably softened as not to admit of being handled. In all cases when black vomiting had occurred, the mucous surface of the stomach was not only ecchymosed and softened, but also ulcerated; the ulcers being very small and often numerous, and apparently the consequences of the ecchymoses, or small effusions of blood in and under the mucous or villous membrane. Red petechiæ and small rounded ecchymoses were also frequent under the serous surfaces. He adds, that all the parenchymatous organs were engorged with fluid black blood, which had frequently gone on to decomposition, causing the presence of gas which was often remarked. M. AUBERT states that he observed the ganglia of the great sympathetic engorged with blood, and presenting numerous red points externally, and internally the colour of wine lees. M. LACHAISE mentions the frequency of red points in the nerves arising from extravasations of blood in their neurilema.

40. *e.* All recent writers concur in remarking the very sensible *alteration of the blood* in this pestilence even during the life of the patient. Blood drawn from a vein, even early in the distemper, does not separate into a coagulum and serum, and there is no fibrinous portion or buffy coat. These elements remain mixed together, presenting the consistence of cream. During venesection, the blood presents, as it flows, the same dark colour at the close, as it did at the commencement of its abstraction; and it often emits a peculiar odour. After standing drops of oil often appear on the surface, and the whole mass speedily undergoes putrefaction. M. BULARD states that M. ROCHET analysed the blood in three cases. The blood was taken from three young and plethoric men, and from the third to the fifth day of the distemper. In 100 parts, there was only six tenths of fibrine, and it contained sulphuretted hydrogen gas. It was always more dense than in health. The venous trunks contained blood, presenting the same appearances and chemical constituents, as that taken away by venesection. The blood in these vessels was fluid and black, it appeared as dissolved, and often contained small oily drops.

41. III. DIAGNOSIS. — Plague is often distinguished with great difficulty from other malignant or low fevers, on the first breaking out of an epidemic, so that physicians, who have been in the habit of seeing plague patients, have been deceived in some instances. The difficulty, however, is only felt at the commencement of an epidemic, and when neither carbuncles nor buboes appear. When these are present, or even either the one or the other, then the nature of the distemper is made manifest. During the prevalence of an epidemic plague, a white chalky tongue, a quick and rapid pulse and headach, are sufficient proofs of an attack, although neither carbuncles nor buboes, nor even petechiæ are present. The septic or putrescent disposition, although greater in this pestilence than in others, is not sufficient to distinguish it in many cases, and especially early in the attack; but, when the affection of the glandular system becomes apparent either alone or conjointly with the other symptoms of malignancy, or signs of a septic tendency, then no doubt of the nature of the distemper need be entertained.

42. IV. PROGNOSIS. — The prognosis in this distemper has been more fully stated by DIEMERBROECK than by any other writer. He remarks that no dependence in general could be placed upon critical changes occurring even in the critical days; when, however, they take place on the sixth day, the disease is always fatal; and he adds, that those who are seized at new and full moon rarely recover. A seizure after a fit of anger; after terror, dread, or anxiety; and after sensual excesses, is especially to be dreaded. The commencement of the distemper during warm, humid weather, and a still or calm state of the air, in warm countries, or during the summer or autumn in colder climates; and in low, close, foul, and crowded localities, amongst a population insufficiently nourished, prone to excesses, and neglectful of cleanliness, is generally followed by a rapidly diffused and fatal epidemic. I shall treat of the prognosis with reference, in succession, to the chief functions of the economy, according to the information furnished by the most experienced writers.

43. *a. The circulating organs* sometimes fail of furnishing those indications of the result which might be expected from them; but this may be owing as much to deficiencies in the observer as to the conditions of these organs. Faintings, syncope, or marked impairment of the *heart's action*, or palpitation at the time of seizure, or soon afterwards, are generally unfavourable. An irregular, unequal, small, weak, and very soft *pulse*, during the course of the distemper; and an intermittent, small, weak, and creeping pulse, at an advanced period, are generally fatal. A rapid, quick, open, and expansive pulse at the commencement or early in the attack, is also unfavourable. An even, not very frequent, or even an almost natural pulse, cannot be relied upon as indicating a favourable result unless accompanied by other favourable symptoms. DIEMERBROECK remarks that a pulse nearly approaching the natural state is deceitful; and that an intermitting pulse is always fatal. The state of the *blood*, as shown after venesection, or by the appearances of the mucous and cutaneous surfaces, and considered in connection with the heart's action and pulse, also indicates the amount of danger; evidence of serious change in this fluid leaving but slight hopes of recovery.

44. *b. The nervous systems*, especially the *organic nervous system*, often furnish evidence of the ultimate result from the beginning of the attack. In some cases the *cerebro-spinal system* is not remarkably affected even during the whole course of the malady; the intellects are not disordered, and muscular power and action are often so far retained as that the patient is enabled to walk about until shortly before dissolution; and although the pulse may have disappeared from the extremities, he can, in some instances, change from one part of the chamber to another. When, however, the powers of the mind are impaired, depressed, or otherwise disordered, at the commencement; or when violent or low delirium occur early; and when apathy, lethargy, stupor, or complete coma appear, the distemper generally terminates fatally. Tremor of the tongue and hands; convulsive movements of the extremities or other parts; contractions or startings of the tendons, generally indicate dissolution, especially when associated with delirium, stupor, or coma.

45. If all the functions which are actuated by the *organic nervous system* be remarkably depressed or otherwise disordered; if the digestive, the assimilative, the excreting, and the circulating functions are either arrested or remarkably impaired; if the vital or chemical conditions of the blood be visibly altered; and if the vital cohesion or tone of the capillaries, and of the several tissues be manifestly diminished, occasioning passive hæmorrhages, and discolourations of the surface, recovery rarely takes place, especially if these changes are very apparent. DIEMERBROECK remarks that epistaxis is dangerous on a critical day, and fatal on a non-critical day. Other hæmorrhages are even still more dangerous.

46. *c.* The *tongue* often indicates the result with much certainty. When it becomes black, or very dry and contracted at the commencement, an unfavourable issue may be expected; but when it preserves a natural appearance and continues moist, or when it regains these appearances, recovery may be anticipated. Severe affections of the *throat*, or pain in this situation, even although there may be neither dryness nor aphthæ, nor tumours, or other manifest cause, often announces a fatal termination. Exudations of blood from the gums, tongue, mouth, or throat, are equally unfavourable.

47. *d.* If the symptoms referable to the *stomach* and *bowels* are severe at the commencement, and especially if *vomiting* be exhausting, frequent, or continued; if the matters ejected be black or unnatural; and particularly if it be attended by singultus, death will ensue. When, however, vomiting is moderate, and when it ceases after the evacuation of green, or greenish-yellow, or bilious fluids, a favourable result often takes place. The occurrence of *diarrhœa*, and even of looseness, especially if the motions are black, or sanguinolent, or give out a very offensive, putrid, or unnatural odour, is generally fatal. On the contrary, *costiveness*, or a natural state of the bowels, at the commencement and during the increase and decrement of the distemper, is a very favourable circumstance.

48. *e.* A free tranquil, and easy state of *respiration* furnishes just grounds of hope; but the more serious disorders of the respiratory organs are most unfavourable. A short cough, short and difficult respiration; a burning heat or pungent pain, or tightness in the thorax; bloody expectoration or hæmoptysis; and signs of pneumonia or of pleurisy, are severally indications of a fatal issue. Frequent sneezings and remarkable fœtor of the breath, or an odour of putrified flesh furnished by the expired air, are indications of approaching dissolution. Alterations of the voice, a rapid or interrupted, or very slow or stammering enunciation; inarticulate or confused speech, are all unfavourable signs.

49. *f.* The *urine* generally fails to furnish any certain indications of the result; and I can find no exact information respecting its chemical conditions in this pestilence. DIEMERBROECK observes that a turbid urine was unfavourable, nevertheless some escaped who passed this urine, whilst many died suddenly or rapidly although the urine was natural, and that in some of these the symptoms did not appear dangerous. He adds, that a thick, oleaginous, brown or blackish urine, or that furnishing a brown or black sediment, was generally a very unfavourable symptom. Those who discharged blood from the urinary organs, either mixed with the urine, or distinct from it, he states died in a short time. HODGES remarks that very offensive urine is a fatal symptom.

50. *g.* The appearance of the *catamenia* during this pestilence is dangerous, even upon a critical day, and most writers view this occurrence as fatal when it takes place on a non-critical day. HODGES says that every hemorrhage is bad, but a flux of the menses is fatal. Women who are pregnant, or lying-in, or threatened by abortion, rarely recover when seized by this distemper, and they are in great danger of being attacked when it is epidemic, unless excluded from all possible medium of infection. Infants born either prematurely or at the full time, after the mother has been seized by the plague, have sometimes presented proofs of the disease having affected them *in utero*, and the distinctive characters of the distemper.

51. *h.* The *external surface* furnishes by its appearances the most certain evidence of the issue of the distemper. When a warm, genial, and general *perspiration* breaks out, no symptom assuming a worse character, a favourable result may be expected. But when the perspiration is clammy, viscid, very offensive, or cold, or even although it be general, when the symptoms are aggravated, or the patient becomes weaker, or feels a sense of sinking, then the distemper terminates fatally. HODGES remarks that "the most certain fatality of all is from such sweats as have a cadaverous smell, although there was sometimes a disagreeable scented sweat, with which they recovered, as with it exhaled the pestilential venom." (p. 144.)

52. *i.* The *glandular tumours*, or buboes, characterising this pestilence, often furnish the best evidence of the issue. The early appearance of these tumours, especially before or without febrile symptoms, is a favourable circumstance; but it is very different if they follow the fever, or if the febrile symptoms are very severe or intense. The occurrence of these tumours below the ears or in the neck, and especially if they increase rapidly, or in the course of ten or twenty hours, or if they be soft, fluctuating, or boggy, either with or without inflammation, is always fatal; and although some patients with tumours thus situated and characterised may not appear otherwise very ill, they die nevertheless. If, on the other hand, the tumours are hard at the commencement, tense and oblong, and increase gradually or slowly, with a moderate degree of pain, and if they continue hard during their increase, a favourable result may be anticipated; and with more certainty if they pass on to suppuration; or when the fever has ceased, they gradually disappear without suppuration. But if hard buboes are surrounded by a circle resembling an iris, or if they assume a dark or fiery red, or a livid or black hue, or if the buboes disappear suddenly, the fever still continuing, death generally takes place. HODGES remarks that "the more buboes there are, so that they suppurate, the better. Carbuncles are always more dangerous than buboes." (p. 140.) DR. MORKA observes that buboes in the armpits are always attended by danger, and an inflammatory affection of the eyes, with difficulty or other disorders of respiration, generally accompanies them, these and other symptoms becoming worse unless they enlarge and suppurate, when an amelioration takes place; but if they remain stationary, or subside, death always results. (*Op. Cit.* p. 427.)

53. *k. Carbuncles* appearing in fleshy parts, from the commencement of the distemper or soon afterwards, are favourable; but if they are seated over or very near the buboes or enlarged glands, over the spine, or on the fingers or toes, they indicate great danger. If they break out slowly there is much risk, and if they are numerous there is still greater risk. If, in the course of two or three days, they are surrounded by a red circle, they generally heal easily and soon, but if they continue to extend, without a disposition to become limited, or if they reach a great size, there is danger, or at least there will be great difficulty in healing them. The prognosis should be still more unfavourable if they are seated on the spine, or over large blood-vessels or nerves. When they disappear suddenly, or when they dry up, the febrile or other symptoms still continuing, a fatal termination soon follows. HODGES says, that "the smaller the carbuncles, and the more remote their situation from the viscera, greater vessels, tendons, and nerves, and the fewer they are in number, by so much it is the better; and, on the contrary, when they spread like a gangrene, and are near the principal parts, as the breast or belly, and also are numerous, or livid, the fate of the patient may be pronounced desperate." (p. 147.)

54. *l. Petechiæ, ecchymoses*, or *spots* of a violet, purple, black, or greenish hue, whenever they may appear, always indicate a fatal issue. A few escape when the petechiæ are red, but even this is an unfavourable symptom.

55. *m.* Dr. CASTRO remarks that evacuations occurring spontaneously in the course of febrile diseases, especially on critical days, are favourable circumstances; that they are quite otherwise than favourable in plague. DIEMERBROECK observes that he has always considered *issues* and *setons*, made with a view of protecting the individual from an attack of plague, as most serviceable, even although he may be seized nevertheless, for if these continue to discharge fully during an attack, the pestilential venom seems to discharge itself by these channels; but if they dry up, or cannot discharge, during an early or more advanced period of the distemper, death will certainly take place. Of the protecting and favourable influence of *issues* on this malady, he quotes the opinions of MERCURIALI, HERCULES SAXONIA, GARNIER, HILDANUS, JOANNES HERCULANUS, and others in support of his opinion.

56. V. THE CAUSES OF PLAGUE.—This subject, in some of its most important relations, has long engaged the minds of eminent medical writers. It has occupied a portion of the attention of the legislature in this country in modern times; and very recently it has been inquired into and discussed in the Royal Academy of Medicine in Paris. I have, in preceding sections of this article, fully examined the *causes* of the *choleric* and *hæmagastric pestilences*, and have demonstrated the existence of *infection* as their chief and efficient cause. However this may be disputed by the interested, by the prejudiced, and by the insufficiently informed, I am confident of its truth. I have written with a full conviction of the soundness of the opinions I have entertained, and with a firm belief that time will not only test, but also prove their accuracy. The inquiry upon which I am about to enter will be prosecuted as follows: — 1st. Is plague caused and propagated by infection? 2d. Infection having been demonstrated, in what does the infectious agent consist, and by what media is it conveyed or preserved? 3d. What are the circumstances, influences, and agents, favouring or determining the action of the infectious or pestilential miasm? And 4th, For what period may infection remain latent in the system until its irruption in a specific form; and how long may the infectious poison retain its powers when preserved in animal or other productions?

57. *A. Is plague caused and propagated by infection?* Conformably with the meaning attached to the word infection, in the use which I have made of it in the two preceding parts of this

article, and agreeably to what I have stated in the article INFECTION, there can be no doubt of the proofs of the infectious nature of this pestilence being most complete, and convincing to all candid minds. In that article I have classed plague in the *third class* of infectious maladies, and have stated the *tests* and *circumstances* proving the infectious nature of this distemper, and of others belonging to the same category. (See INFECTION, § 4. 15.) Lest I may be viewed as having espoused a particular doctrine without sufficient evidence of its truth, I shall *first* adduce a sufficient number of the innumerable facts upon record proving the infectious nature of this pestilence; and *next* inquire into the objections which have been urged against a most important doctrine as respects the best interests of the community.

58. *a.* Plague has been generally considered as both an *endemic* and *epidemic* distemper; it has been viewed as endemic in Egypt and Syria, where also it is frequently epidemic, and only epidemic after various prolonged and indeterminate intervals, in most of the countries bordering on or approaching to the Mediterranean shores, and less frequently or much more rarely in those which are further distant from them. It has been said to be non-infectious or non-contagious when appearing endemically, sporadically, or primarily; and to be contagious by some, infectious by others, and both contagious and infectious by many, only when it appears in an epidemic form. These views have been often hastily taken, and the terms in which they are expressed have been as loosely as inaccurately employed. The meaning which the numerous writers on the subject have attached to the words contagion and infection has been vague in most instances; different writers employing them with a different import, or with a different range of meaning; and even the same writer using them without either precision or distinction. From what I have stated in another article (see INFECTION) it will be seen that I have used *infection* as the generic term, and *contagion* as a form of infection, or as that infection of a healthy but predisposed body produced by immediate or mediate contact of a diseased body, or of the secretions of a diseased body, the contagious agent propagating a specific malady and perpetuating its kind. I have applied the term infectious to those maladies which are propagated and perpetuated, without contact, and by means of an animal miasm or emanation, proceeding from the bodies of the diseased, and affecting predisposed or susceptible persons with a distemper identical with that which produced the infecting miasm or emanation.

59. Taking the most extended view of *infection*, and considering it a result of whatever may contaminate the fluids and solids of a healthy body, as I have done in that article, we shall find that *contagion* is a mode only of *specific infection:* and that whilst all specific infections proceed from more or less diffusive, or more or less consistent animal emanations or secretions, which affect the system through the medium of either the respiratory or the cutaneous or mucous surfaces, contagion is infection by those secretions which act chiefly by contact with, and through the medium of, the external surface of the body. It is obvious from this, that, as the major includes the minor, so all contagions are also infections; that infection has a wider range of acceptation than contagion; and that amongst the several infectious agents, some act through the medium of the lungs, others through the medium of the external surfaces, and many through either channel, or through both, according to the circumstances or modes in which the infectious agent may be presented to the healthy frame. Thus infectious emanations or secretions from specifically infectious maladies may affect healthy predisposed persons: — 1st. When diffused in the air either directly from the diseased body, or mediately from woollen, or body or bed-clothes, which had retained these emanations for a longer or shorter period, the air thus contaminated affecting the healthy through the medium of the lungs; — 2d. When applied in a more or less consistent or tangible form to the cutaneous surface, or to the outlets of mucous canals: — and 3d. When presented to the healthy economy in either of or in both these modes. Hence some distempers, as the two pestilences already treated of, are propagated and perpetuated in the *first* of those modes only; whilst others are communicated in the *second* of those modes, as itch, syphilis, rabies, &c.; and some are transmitted in *both modes*, as plague, small pox, &c. The *first* order is simply *infectious*, the *second* is *contagious*, and the *third* is both *infectious* and *contagious*. (*See Art.* INFECTION, § 4.)

60. Much difference has existed among writers as to the country or countries in which the plague is *endemic*, or in which it is generated, or its germs preserved; and as to whether or not it is always present in few or rare instances, although not commonly observed, when it is not generally prevalent, — whether or not it is generated *de novo* in those countries, after intervals of entire extinction, or is the infectious poison always preserved by means of few or occasional cases, thereby imparting to it an appearance in those places, of a sporadic or endemic distemper. Many of the ancients, as well as writers of later epochs, as MEAD, ADOLPHUS, ARBUTHNOT, FODÉRÉ, and others, have considered Egypt to be the most productive source of this pestilence; whilst PROSPER ALPINUS, TARGIONI, and OLIVIER have believed that, although frequently observed in this country, it is generally introduced from Ethiopia, where it is generated by a hot sun from a deep and rich soil, kept almost constantly humid by the rains, a malignant miasm being produced from this source, that constantly gives origin to a malady, whose effluvium propagates and perpetuates itself. Whether originating or not in these or other countries bordering on the Levant, and whether it arises from this or other sources, there can be no doubt of the rapid spread of this pestilence from person to person, especially in certain circumstances which evidently favour this diffusion, although the exact nature of these circumstances are often not very manifest, or altogether unascertained. That this malady is propagated in one or other of the three modes to which I have just now endeavoured to assign some degree of precision, cannot be denied by any one who has perused a portion of the annals of pestilential diseases with an unprejudiced mind; but the chief difficulty is to determine the particular mode in which it is transmitted; and it is by no means a

matter of small importance, that the exact mode or channel of transmission observed by this pestilence should be ascertained, inasmuch, as upon it all protective and prophylactic measures should be based. After perusing the evidence which I shall have to furnish respecting the transmission of this distemper from person to person — and this evidence can only be, owing to my confined limits, a very small portion of that which might be adduced — the reader will readily come to a conclusion as to the channels by which this transmission takes place, even without that assistance which it is my duty to afford.

61. Dr. HENNEN, who took great pains to investigate the origin and propagation of the plague in Malta in 1813, and who has confirmed the accounts of this epidemic furnished by Drs. CALVERT, FAULKNER, and TULLY, remarks that, "it has been among medical men, I am sorry to say, that doubts have principally arisen as to the contagious nature of plague. This gross and dangerous error, in point of fact, has sprung from that most fruitful source of deception — preconceived theory; and it has been aggravated by neglecting to define the terms employed, which is altogether inexcusable, and which has exposed us to no small portion of ridicule among the better informed non-professional men who have interested themselves on the subject."

62. The signs or tests by which a disease may, with the utmost certainty, be proved to be infectious or contagious, or both the one and the other, have been fully stated in the article INFECTION (§ 15.). Now whoever will examine the accounts of the plague furnished by those who have witnessed its ravages, will find most convincing evidence of the following truths: — 1st, That it is most liable to attack those who approach patients affected with it, and that in proportion to the nearness of the approach; 2nd. that those who avoid all intercourse with persons affected with the plague generally escape the distemper. These are facts recognised and acted upon by all persons who have had opportunities of observing the progress of this pestilence; and there are few facts in medical history so well supported by evidence as these are, and as to which the experience of past and present times is so uniform and conclusive. A recent writer has remarked, that the most remarkable examples of the communicability of this distemper are afforded by the introduction of it into countries which had long been free from it, in consequence of intercourse with places in which it was then raging. The clearness with which this intercourse has been often traced is truly wonderful, considering the many temptations which travellers, traders, mariners, and commercial men, coming from countries where the plague is prevailing, have to clandestine intercourse, and the frequency of deception practised by illicit dealers, smugglers, and others. Of such histories there are so many on record that the difficulty is which to select; although it must appear very difficult, if the subject be viewed in a proper light, to trace the origin of an infectious malady, especially when such malady may be propagated by the poison retained, even for a very considerable period, in articles of clothing and bedding. Indeed, in many cases of the importation of plague into places remote from or even approximating the Levant, several circumstances and occurrences have taken place, proving the introduction of the infection not by one channel, article, or person merely, but by several in the course of a few days; and thus the accounts given of the origin of the distemper have varied in some instances, and have thereby apparently weakened, although actually strengthening, the evidence of imported infection. Besides, the difficulty is greatly increased as respects this pestilence, as well as others, by the circumstance of a very large number, and sometimes all, the very earliest cases being either concealed or denied, or mistaken for some other fever, — a fact of more importance than generally acknowledged in tracing the early history of an epidemic. Owing to the difficulties now adverted to, and to the fact of the plague appearing in places holding frequent intercourse with countries where it was raging at the time, the infection having been conveyed in more ways than one, several of the outbreaks of it in various parts of Europe during the 15th, 16th, and 17th centuries have been either imperfectly described or unsatisfactorily accounted for; but such is by no means the case with others, and especially the more recent. The plague appeared at Marseilles in 1720, after an immunity of seventy years. A vessel from Seyde, in Syria, arrived in that port on the 25th of May, after having lost several of the crew and of the passengers during the voyage by this distemper, and among these the surgeon of the ship. On the arrival of the vessel, the crew and cargo were landed at the lazaretto. Soon afterwards the disease attacked, in succession, another of the crew, an officer put on board to superintend the quarantine, a boy belonging to the ship, two porters employed in unloading her, then four other porters, the priest who had administered the last sacrament to the sick, the surgeon of the lazaretto, and his whole family. Notwithstanding these events, the passengers, having performed a short quarantine of less than twenty days, were allowed to take up their quarters in the town, and to carry with them their clothes and packages, conformably with the advice of the anti-contagionists of that place and time. As Dr. GOOCH has very justly remarked, when passengers after a voyage of nearly four months and a quarantine of nearly three weeks, are at length let loose in a large city, their first employment is to roam about the streets; they have things to sell, and to buy, and to see. They come in contact in the streets and in the shops with persons whom they think no more about and who think and know no more about them.

63. It is not surprising, therefore, that the exact traces of the distemper should be lost, in all such circumstances; and that it should be often difficult, and even impossible, to follow the progress of it in its various courses towards the general infection of a community. Dr. BERTRAND, a resident physician at Marseilles at the time, states that it is most certain that the plague was on board Captain Chataud's ship; that it was communicated to the infirmary by the merchandise with which it was freighted; that one of the first who fell sick in the city had been passenger in the ship, and had only quitted the infirmary a few days with his clothes and merchandise; that among the very early victims of the distemper were the family of a famous con-

traband trader, near the convent of the Carmes, and those of contraband traders, residing in the Rue de l'Escale and vicinity; and that the suburb adjoining the infirmary was attacked nearly at the same time as the Rue de l'Escale. I leave my readers to make the reflections naturally suggested by these facts."

64. Numerous incidents occurred during the early prevalence of the pestilence in this city, proving the channels or modes of its extension; but it is sufficient to notice one or two of them only. The Hôtel Dieu contained between three and four hundred foundlings of both sexes, besides the officers and attendants. A woman from the Rue de l'Escale presented herself at this hospital, stating that she was ill with a common fever, for in this pestilence, as in many others, the first cases were not admitted to have been the plague, and numerous misrepresentations were made respecting them; and hence the unrestrained progress of the mischief, and the loss of much valuable time, or rather the entire loss of that time, in which alone it could have been limited. She was taken in and conducted to her bed by two maid-servants. The next day the two maid-servants fell ill and died in a few hours. The day after, the matron, who had visited the patient, fell ill and died almost as suddenly. The disease spread with amazing rapidity, and destroyed all the children, with every person belonging to the house, excepting about thirty, and these took the infection but recovered.

65. An official report transmitted to Paris stated that the physicians and surgeons of Marseilles unanimously declared, "that when one person in a family was attacked and died; the rest soon underwent the same fate, insomuch that there were instances of families entirely destroyed in that manner; and if any one of an infected family fled to another house, the contagion accompanied him, and proved fatal to the family where he had taken refuge."

66. The removal and interment of the dead as the pestilence extended were amongst the greatest difficulties experienced by the authorities of this city. At first beggars and vagabonds were employed in casting away the dead bodies; but these soon were seized by the distemper, "and those who followed them in their offices soon followed them in their fate." Convicts were then supplied from the galleys to carry away the dead, and promised their liberty if they survived. The first supply amounted to 133, but these perished to a man in less than a week. A hundred were next granted, and in six days they were reduced to twelve. The population of Marseilles was calculated at the outbreak of the pestilence at about 90,000 souls; but many left the city when the distemper began to spread. Upwards of 40,000 persons died; so that, comprising those who recovered and who left the city, very few escaped an attack. But this pestilence was carried to Aix, Toulon, and various other places in Provence, in which upwards of 80,000 persons died of it.

67. Whilst the horrors attendant upon this pestilence were going on, intercourse was almost unrestrained, excepting in some places in which precautions were used to prevent communication with the infected, and which either escaped altogether, or in a great degree, according to the strictness with which the precautions were observed. When the distemper was admitted to be the plague, the galleys were detached from the shore, anchored in the middle of the port, and separated from other vessels. Three hospitals were appointed: one for the crews, the other for the convicts. In the former, those infected with the plague were placed; in the latter, those labouring under other diseases were kept. To the third, all doubtful cases were sent. The population of the galleys amounted to 10,000, yet 1300 persons only were attacked, and about half recovered. There are various ways in which precautions against intercourse with infected persons, and against the introduction of infected substances, may have been evaded without detection; but there is a very remarkable difference between the numbers attacked where no precautions were taken, and where precautions were adopted, although they were most probably partially evaded. A certificate given by the Bishop of Marseilles states that "the plague has not penetrated into the religious communities who have had no communications with persons abroad, and who have used the precautions necessary to protect them;" and another given by the first sheriff of this city states that "the families which were shut up and had not communicated abroad, particularly the nunneries, had been protected against this scourge; which was introduced into some of them by communications with strange persons."

68. DR MERTENS, a physician of eminence practising in Moscow, has given a full account of the plague which visited that city in 1771, after an absence of a century and a half. War commenced in 1769 between Russia and Turkey; the next year the plague appeared in Wallachia and Moldavia; and many Russians died of it in the city of Yassy. The following summer it entered Poland, and was conveyed to Kiow, where it carried off 4000 persons. At first all communication was cut off between Kiow and Moscow; but a colonel and two soldiers left Choczin, where the plague was raging, for Moscow. The colonel died on the road, but the two soldiers reached Moscow, were taken ill at the military hospital, and died there soon after their arrival. This occurred in November 1770. Towards the end of this month the demonstrator of anatomy at this hospital was attacked by this distemper, and died on the third day. The male attendants lived with their families in two chambers separated from the others; and in one of these eleven persons fell ill in a very short time with a putrid fever, attended by petechiæ in some, and by carbuncles or buboes in others, and most of them died from the third to the fifth day. The same distemper attacked the attendants residing in the other chamber. On the 22d December eleven physicians assembled, and ten out of the eleven declared the disease to be the plague. The hospital was closed, and a military guard interrupted all communication. Those affected by the distemper, with their wives and children, were separated from the rest, and the clothes and moveables of those who had died of the disease and who were still ill with it were burnt. The weather became intensely cold, and the traces of infection were lost in the hospital and in the city. The communications with the hospital were opened in February, 1771, but on the 11th of March the physicians were again con-

voked, and Dr. YAGHLSKY stated that eight persons had been attacked in a large manufactory of military clothing, containing 3000 persons, situated in the centre of the city, with symptoms similar to those observed in the patients in the hospital three months before. The workpeople declared that in the beginning of January a woman who had a tumour in the cheek had gone to the home of one of them, and that the disease had afterwards spread in the manufactory, and 117 persons had died of it. The manufactory was closed and guarded; nevertheless several of the workpeople escaped on the following night by the windows. Precautions were taken to prevent the spread of the distemper, and an abatement of it became manifest; but these precautions were relaxed, and the progress of the malady became rapid. "Towards the end of July the mortality amounted to about 200 daily; by the middle of August, to 400; towards the end of the same month, to 600; at the beginning of September, to 700; some days afterwards, to 800; and at length to 1000 daily. On the evening of the 5th of September the populace rose, broke open the hospitals, put an end to the quarantine, and restored the religious ceremonies used for the sick; the images of saints were carried with great pomp to the sick, and kissed by every one successively. The people, according to ancient custom, embraced the dead, and buried them within the city, declaring that human precautions were odious to the Divinity; they hunted down the poor physicians, broke their furniture, and sacked their houses. This riot lasted only a few days, but it was followed by the addition of two or three hundred to the daily mortality. Almost all the priests perished." The pestilence began to decline in October, and at length ceased with the end of the year. The mortality was estimated at more than 80,000, exclusive of that in the towns and villages to which the distemper had extended. In these the deaths were upwards of 20,000; but they suffered much less, because in most places, the inhabitants, taught by the miserable example of Moscow, readily permitted precautions to be used. Criminals were employed to bury the dead, and when these perished, the poor were hired to do it, and provided with covering of oil-cloth to protect them, but these, and the advice given them, were neglected. Most of them were attacked about the fourth or fifth day, and most of them perished. The plague was most fatal to the poor; nobles, gentlemen, and merchants generally escaping, owing to the precautions they had taken. Dr. DE MERTENS states that the distemper was communicated only by the touch of infected persons or clothes, and that the physicians, who only inspected the patients, and who touched neither the bodies, nor the clothes, nor beds of the sick, generally escaped, but that a number died of the surgeons and assistant surgeons who touched the patients.

69. Whilst the pestilence was ravaging the city, the Foundling Hospital afforded a remarkable proof of the salutary effects of seclusion. It contained 1000 children and 400 adults. All communication was cut off, and the plague never entered the building. One night, four attendants and as many soldiers escaped from it, and on their return were attacked by the malady; but they were separated from the rest of the house, and no others were infected. The contrast between the fate of this hospital and that of the foundling hospital at Marseilles (§§ 64.) cannot fail to strike the reader.

70. The plague raged in Cyprus from April, 1759, until June, 1760. Dr. RUSSELL states that it was introduced by a large Turkish vessel from Alexandria, that was wrecked on the island in the month of April; and of the crew, who were saved, a great part were infected with the plague; and that, whilst numerous cases were occurring in consequence at Limsol and the vicinity, where this vessel was wrecked, a ship from Damietta arrived at Larnica and landed, on the 22d of May, infected passengers and sailors, who lodged in the houses and communicated freely with the natives. Another vessel from the same place arrived some time afterwards with infected persons on board. During the hot months of July, August, and September, little was heard of the pestilence, "but it continued lurking in these parts, showing itself only by starts," until October, when it greatly increased in those places where it had been introduced, and in the adjoining villages. The plague soon afterwards appeared at Nicosia, to which place the annual fair had drawn a great concourse of people from most parts of the island. But the nature of the distemper was concealed, and the bodies were buried during the night to prevent alarm. It increased rapidly from this time, and destroyed about a third of the population of the island. The convents and European merchants observed seclusion; and wherever this precaution was strictly observed, the distemper did not appear.

71. Dr. RUSSELL, in his account of the plague, which raged in Syria during 1759, and three following years, states that it appeared first at Saffat in October, and had been brought there by some infected Jews, who came from Alexandria. It afterwards spread to Sidon, Acre, Latakea, and Tripoli; and prevailed greatly in these places and the vicinity during the first six months of 1760. "Jerusalem received the contagion in January, and in the beginning of March it reached Damascus; in both which places, as well as in the smaller towns and villages of Palestine, it made dreadful havoc during the subsequent months." Dr. RUSSELL, who was residing at Aleppo, remarks that at this time an extensive commerce existed between this city and infected places, and a total inattention to the means of prevention opened many channels for the reception of the distemper. Accordingly the introduction of it soon took place; and in the following way. Three Turkish merchants, who had come in the Damascus caravan, were lodged in a public khane, near the British consulary house, and after a stay of a few days they set out from Aleppo on the 16th of May. Next day the porter of the khane, an Armenian, and his son were suddenly taken ill; and soon afterwards the brother of the porter. The son died on the 19th. These men had been in attendance on the Turkish strangers, and had assisted in moving and packing their baggage. Dr. RUSSELL visited these two men on the 21st, and ascertained the existence of the plague, of which they died on the 22d and 23d. Towards the end of this month caravans arrived from Jerusalem and Damascus, in which were infected persons. These were, under various

pretexts, refused admission into the city, but they encamped without the walls, and buried several persons during their stay; but several individuals found private lodgings in the town. The pestilence began now to prevail both in the suburbs and within the city; and the cases were numerous early in June; but it did not become very prevalent, and soon afterwards subsided, although it extended to the villages scattered between the neighbouring mountains, and to various Arab tribes, and to the Bedouins, among whom it was remarkably fatal. During 1761 and 1762 the distemper continued, with varying degrees of prevalence and fatality, throughout this country. It became epidemic in these years, during May, June, and July, in Aleppo, and was most fatal in the last year; during the three years of its prevalence in Syria, the infection appeared to spread with varying degrees of rapidity in different places. Whilst only straggling cases were observed in Aleppo, it was rapid in its progress among the Arab tribes in the vicinity; and when less prevalent among these, it extended more generally among the Turkish inhabitants of Aleppo. The higher classes and the merchants, especially Europeans, used more or less strict precautions, or entirely shut themselves up; and escaped in every instance where the precautions were strictly observed.

72. Mr. JACKSON, in his account of the empire of Morocco, states that the plague has visited this country about once in every twenty years; and that the visitation of 1799 was more fatal than any previously known. It first appeared in Old Fez, and was imputed to the importation of infected goods from the Levant, by some; and to the destruction of immense swarms of locusts, which had infested West Barbary during seven years, and been immediately followed by epidemic small-pox, which had preceded the plague. This pestilence pervaded the whole empire, and in many places did not leave persons living sufficient to bury the dead. Mr. JACKSON resided at Mogadore during its fatal prevalence in that city. He states that the European merchants shut themselves up in their respective houses, as is the practice in the Levant, and escaped the pestilence; but that he "did not take this precaution, but occasionally rode out to take exercise." He remarks that his daily observations convinced him that the distemper "was not caught by approach, unless that approach was accompanied by an inhaling of the breath, or by touching the infected person." (p. 278.) He further adds that, during the epidemic, he took "no further precaution than that of separation, carefully avoiding to touch the hand or inhale the breath;" and he is of opinion that the plague is not produced by the atmosphere, but is "caught solely by touching infected substances, or by inhaling the breath of those who are diseased." It has been said, he observes, "that the cultivation of a country, the draining of the lands, and other agricultural improvements, tend to eradicate or diminish the plague; but we have seen countries depopulated where there was no morass or stagnant water for many days' journey, nor even a tree to impede the current of air, or a town, nor anything but encampments of Arabs, who procured water from wells of great depth, and inhabited plains so extensive and uniform as to resemble the sea." (p. 279.)

73. The plague of Malta, in 1813, is rendered memorable by the proofs of the introduction of the infection, and by the measures used to arrest it, founded on a belief of its infectious and contagious nature. The history of this plague has been recorded by CALVERT, FAULKNER, TULLY, and HENNEN, all of whom agree as to the fact of the introduction of the distemper. The pestilence had not appeared in Valetta for 137 years, and was now introduced by a vessel from Alexandria, where it was then prevailing. Two sailors had died of it on the passage, and after the arrival of this ship the captain and his servant, soon afterwards a smuggler of the name of Borg, his wife, children, and father were seized with it, and all died; then a midwife who attended the wife of Borg in the premature confinement caused by the plague, a young woman who slept in her house, a kinsman who entered her chamber and touched her body, the child of a master of a wine-house near the quarantine harbour, where, among others, the servants of the health-office who guarded the infected vessel in the harbour, and some of the guards of this vessel themselves, with whom Borg, the smuggler, had frequent dealings. Whilst the distemper was attacking in succession the above-mentioned persons, it appears by the official statements that no other individuals were affected by it in any other part of Malta. It is admitted that there was no positive evidence beyond rumour, of communications between this vessel and Borg and his family; but what evidence can be expected in this and similar cases of undetected smuggling. Rumour in such cases is often near the truth; and that it should be true in this, as to the secret conveyance of articles from the infected ship, is extremely probable. The facts of Malta having been free from plague for 137 years; the arrival of an infected vessel, from an infected port, at the principal city of the island; and the almost immediate appearance of this pestilence after the arrival of this vessel, are of themselves demonstrative of the introduction of it, without the particulars connected with the communications between the vessel and the city being proved — particulars, from their nature, and the circumstances of their occurrence, that cannot admit of proof, as being secret; and of a nature which, if detected, would have led to the severe punishment of those engaged in them. But it is not the mere introduction from a distance that proves the infectious nature of a distemper, but also the subsequent diffusion of it, and the means found to be successful in guarding against it.

74. At first the malady was confined to the crew of the vessel which came from Alexandria and to Borg's family and those who had communicated with them; but it soon afterwards appeared in the town of Valetta. At this time the medical men contended that the malady was not the plague; and those attacked concealed their sickness from fear of being removed to the lazaretto, clamoured against precautions, and did all they could to thwart them. Hence the distemper spread not only through Valetta, Florians, and the adjoining towns, but also to many villages.

75. The efficacy of *strict seclusion* was demonstrated by some striking instances during the

prevalence of the distemper in Malta. The Augustine Convent stands near the top of one of the main streets of Valetta. When the plague appeared, the strictest precautions were used to prevent all communications with the town; but a servant went into a part of the town where it prevailed, and purchased clothes supposed to be infected. Soon after his return he confessed what he had done; he was immediately shut up, with one of the brotherhood who volunteered to attend him. Both of them were seized and died of the distemper, but no other person in the convent suffered. "When the plague was in Malta in 1675, CAVALLINO, who described it, states that all public establishments which cautiously shunned intercourse with the community, enjoyed perfect exemption from the disease; as did the prisons and monasteries, besides all the vessels in the harbour. In the late plague it was the same; the hospital of St. John of Jerusalem, the prison, and several public offices, and private houses, which early adopted, and steadily kept up, a rigid system of insulation, were not less fortunate."

76. A large building in Valetta had its ground-floor divided into seven separate apartments, occupied by as many Maltese families; and its upper stories used as a military hospital for patients affected with common diseases. During the plague of 1813, the ground-floor was penetrated by it; the inhabitants of four of these apartments were destroyed by it, and two only of each family escaped in the other three. While this was going on below, the sick tenants of the upper stories were shut in, all communication was cut off, and every individual among them escaped the pestilence, although it was raging in the houses around, and penetrating from the lower to the upper stories. Dr. GREAVES, whose house was within a few feet of this hospital, related this fact to Dr. M'LEAN, at Valetta, and led him over the hospital, but no mention is made of it by this uncandid writer and ignorant physician. I say this from personal knowledge.

77. The anti-infectionists contend, that the plague of Malta was not introduced by the ship which arrived from Alexandria very shortly before its outbreak, but from "a noxious state of the air;" and it has been shown, at other places, that they attribute the choleric and hæmagastric pestilences also to noxious states of the air; but, how is it, that this noxious air, which plays so important a part in the production of plague according to them, did not produce one of the other pestilences? We have seen that these three several forms of pestilence have ravaged the same places at different times; and, taking it for granted, that they all arise from "a noxious state of the air," as the anti-infectionists would have us to believe, in what does the noxious air producing the one pestilence differ from that producing the others? It has now been shown by numerous proofs, and many more may be, and some will be, further adduced, that, whilst the distemper was depopulating numerous houses and streets, other houses and institutions, completely surrounded by these houses and streets, remained entirely uninfected, by observing the strictest separation. If the mischief was solely in the air, how came these isolated places to escape, not only during the prevalence of plague, but also during the prevalence of the other two pestilences as shown in the appropriate places? And, moreover, how came "the noxious state of the air," causing the plague of Malta, after 137 years, the plague of Moscow, after 150 years, and the plague of Marseilles, after 70 years, to occur at such distant periods, and no indications of its existence in the intervals to have appeared? And how can the anti-infectionists prove this "noxious state of the air," this undefined, this suppositious, this airy, this baseless entity or non-entity, and account for the wonderful re-appearance of it, after so very many years just at the moment most desired to serve as an argument against the introduction of the plague by an infected vessel? And, again, from whence came the "noxious state of the air," which, according to the anti-infectionists, produced the choleric pestilence, and which had never previously existed, inasmuch as its imputed effects, this particular distemper, was not known to have ever appeared before 1817?

78. Dr. MACKENZIE resided at Constantinople and Smyrna for about twenty years, in the middle of the last century; and during that period scarcely a year passed without some appearance of the plague in one or both of these cities. He communicated his observations on the distemper to Dr. MEAD and Dr. CLEPHANE, which were published in the forty-seventh volume of the "Philosophical Transactions." The plague raged with great violence at Constantinople in 1751, and destroyed about 150,000 persons; and Dr. MACKENZIE, who was then residing in this city, remarked respecting it, that "he could see no other apparent cause of the virulency of the disease this year, beside the occasion of greater communication. In the months of February, March, April, and May last, the distemper was so strong at Cairo, as appears by letters from the English consul there, that no doors were opened for three months. In the mean time there arrived here, in May last, four ships laden with Cairo goods, which goods and men being landed, spread the infection over all the city at once, after which one conveyed it to another by contact. In the village where we lived, there died only sixty persons of the plague. The French ambassador's palace, next door to us in the village, was infected, because five of his people went at midnight to a bawdy-house, where the father Demetry, the mother, and daughter had the plague and died of it afterwards, all three; so that two of his excellency's servants were infected by them, one of whom died, and the other recovered and is still living, after taking a vomit, some doses of the bark mixed with snake root and Venice treacle, by my advice. We found this last time, and upon all such occasions, that whoever kept their door shut ran no risk, even if the plague were in the next house; and the contact was easily traced in all the accidents which happened among the Franks."

79. SAMOLOWITZ, who had extensive experience of the plague in Poland, Moldavia, Wallachia, and lastly, in the epidemic of Moscow, states that it is certain that this distemper is propagated by contact; and ORREUS, who was sent by the Empress Catherine of Russia to advise during the plagues at Yassy and Moscow, remarks that the most common mode of contracting the disease was by contact. When Mr. HOWARD went in 1785 to visit the chief lazarettos in

France and Italy, he carried with him a set of questions concerning the plague, drawn up by Dr. AIKEN and Dr. JEBB, which were to be submitted to the most experienced practitioners in the places which he visited. On his return, Dr. AIKEN methodised and abridged the answers, and the result is given in the celebrated work on the Lazzarettoes of Europe. "They all," says Mr. HOWARD, "in the most explicit manner concur in representing the plague as a contagious disease, communicated by near approach to, or actual contact with, infected persons or things."

80. During the war, at the end of the last and commencement of the present century, the medical officers of both the French and English armies had numerous occasions of observing the plague, and they almost unanimously concluded that it was a contagious disease. Even Dr. BANCROFT, who strenuously contended against the infectious nature of the Hæmagastric pestilence, and who was present with the English army during a part of the Egyptian campaign, states that "the facts which prove the necessity of actual contact with some infected person or thing to communicate the plague, are so numerous, and many of them so notorious, that it must be unnecessary for me to enter upon a detail of them, after what Dr. RUSSEL and others have published, and after the experience of the British army in Egypt, which invariably demonstrated this necessity, by showing that all those who avoided contact, invariably escaped the disease, whilst those who did otherwise in suitable conditions, were very generally infected. Nor was there, so far as I have been able to discover, any instance, in the French Egyptian army, of a communication of the disease without contact, though the physicians to that army, who have written on the subject, do not, I believe, positively assert the impossibility of such communication."

81. Sir JAMES M'GRIGOR, physician to the Indian army in Egypt, during the Egyptian campaign, in his medical sketches of that expedition, gives the following account of the arrangements at the pest-houses, and their result:— "In the pest-houses of the army thirteen medical gentlemen did duty, who in the Indian army might be said to have had the post of honour. In order to take from our medical gentlemen, in the pest-houses, some of the most dangerous part of the duty, it was my wish to procure some of the Greek doctors of the country to reside in the pest-houses, to feel the pulses there, draw blood, open and dress buboes, &c. The most diligent search was made for those people, and very high pay was promised to them, but we could tempt none of them to live in our pest-houses: a plain proof of the opinion which they entertain of the contagious nature of the disease. The thirteen gentlemen first mentioned, were those only that were directly in the way of contagion, for it became their duty to come in contact with the infected, and seven of them caught the infection, and four died. To the atmosphere of the disease, all the medical gentlemen of the army were exposed, as they saw and examined the cases in the first instance; but, except from actual contact, there never appeared to be any danger."

82. The medical officers of the French army came to similar conclusions. DESGENETTES, in his *Histoire Médicale de l'Armée d'Orient*, thus sums up his opinion on the subject of the plague:— "The plague is evidently contagious, but the conditions of the transmission of this contagion are not more exactly known than its specific nature. The dead body has not appeared to transmit it—the animal body in a heated state, and still more in a state of febrile moisture, has appeared to communicate it more easily; the contagion has been known to cease in passing from one river to another of the Nile; a simple trench made before a camp has been known to stop its ravages; and on observations of this kind is founded the useful insulation of the Franks, the practice of which has been sufficiently detailed by different travellers."

83. Baron LARREY states a similar opinion:— "But however strong may have been these affections, (moral,) their effects cannot be compared to those which resulted from the communication of the healthy with the sick, or to the effects of contact with contaminated objects. We may be convinced of this truth, by the ravages which the plague made in the year 9, (1801,) among the Fatalist Mussulmen. It were to be wished that, on the first days of the invasion of the plague, its true character had been presented to the army. This would have diminished the number of victims; instead of which the soldier, imbued with the opinion which was at first propagated, that this disease was not pestilential, did not hesitate to seize and wear the effects of his companions dead of the plague. The pestilential germ developed itself in these individuals, who often sunk under the same fate. It was only when they had gained a perfect knowledge of this disease, that many preserved themselves by the precautions which were indicated."

84. Dr. SOTIRA, another of the physicians of the French army, in Egypt, relates the following striking circumstance:— "In the seventh year of the French republic, about eighty medical officers died of the plague. In consequence of this mortality, an order was issued to employ Turkish barbers in the pest-houses, to dress the patients, and to undertake all the medical treatment which required actual contact. The result was, that during the next two years, only twelve of the medical officers died of the plague; but half the Turkish barbers caught it." I now arrive at—

85. *B. The opinions of contemporary writers as to the infectious nature of the plague.—a.* The French government, with the view of causing an alteration of the quarantine laws, lately referred the consideration of the communicability of this pestilence to the Royal Academy of Paris; and this body appointed a commission to inquire into the matter. This commission has published its report, and with it numerous documents from medical men who have served in Egypt and Syria during the last twenty or twenty-five years. Certain of these documents are answers to questions which were sent to the British consul in Egypt by the foreign minister; and others are essays on the subjects in question by various medical men attached to the army and civil establishment of the governor of that country. From these the Academy has drawn up its report; which, however, is of much less importance and interest than the papers on which it is founded. The opinions conveyed in all these papers agree as to the communicability of this distemper from person to person; they differ merely as to the modes of com-

munication and the circumstances favouring and preventing infection.* It is thus stated by the reporters, that nearly all the physicians in Egypt (there are considerably upwards of a hundred French and Italian physicians in this country) believe in the transmission of the plague by means of the emanations proceeding from the bodies of plague patients; and that Dr. GRASSI, physician to the lazzaretto at Alexandria, alone espouses the doctrine of the communication of the distemper by immediate or mediately contact only, and without the interposing medium of the air; and they add that the Egyptian physicians consider that a prolonged stay in the chambers of those affected is particularly dangerous, and the more so the more that ventilation is neglected.

86. Dr. GRASSI, who has written a long memoir on the dissemination of the plague, has had an experience of twenty-nine years in Egypt and Syria, during which time his opportunities of observing this pestilence, especially as physician to the lazzaretto, have been great beyond all others. He adduces numerous proofs in support of his opinion; but Dr. CLOT-BEY and some others contend, in opposition to him, that they would not have taken place, or in other words, the same results would not have followed the circumstances adduced, if observed at other periods, or in other places, than those of epidemic influence. The facts are so numerous and so well authenticated of the communication of the distemper, that they cannot be denied; but those who espouse the doctrine of conditional infection, as many of the Egypto-European physicians appear to do, contend that the infectious property exists only in respect of the epidemic, and not of the sporadic or endemic malady; and that if the epidemic influence did not exist, no infection would take place. According to this view the distemper cannot spread by infection without the epidemic circle, and when the infection is conveyed to a distance by persons or clothes, it cannot propagate itself unless there be existing at the time and place an epidemic influence favourable to this effect. In what this influence consists is not shown. It is not admitted to be merely a humid, stagnant, or impure air, as this state of the atmosphere is frequently observed without the distemper becoming prevalent; it is therefore believed by the supporters of this doctrine, that there must be some other superadded property, constituting, with or without the other properties of humidity, stillness, and a certain range of temperature, the epidemic influence in question; and that it is developed generally after lengthened intervals, or after terms of ten, fifteen, or twenty years, the terms being of different durations in different

* It should be kept in recollection that French writers limit the term *contagion* to the communication of a disease from the sick to the healthy by immediate contact; and that they apply the term *infection* to the transmission of disease by miasms proceeding from the sick, and contaminating the air respired by the healthy. In many of the writings of French pathologists, "*Foyers Epidémiques*," epidemic foci, influences or centres, play a very prominent part; and, according to many, no infectious disease can extend without this epidemic centre or influence be present. Some even suppose that the epidemic influence is itself the infecting agent; and they, with many others, argue that this influence, as well as all emanations from the soil, from matters decaying or putrifying in or on the surface of the earth, and from the bodies of the sick, are severally *infectants*, without however distinguishing between each, and confirming, as British pathologists have uniformly, the word *infection* to the spreading of a disease from the sick to the healthy by means of emanations proceeding from the former, and producing and perpetuating in the latter the same disease, possessing the same property of disseminating and perpetuating itself. In this report of the Academy, as well as in some of the papers on which it is based, the "*foyer epidémique*" has a most prominent place assigned to it. If a case of plague occurs without spreading to others — if the several circumstances preventing the extension of the distemper be present or are observed — if a free ventilation of the sick, or of their effects, &c. be enforced — if the sick be not approached, and other means of prevention be observed — if those communicating with the infected be protected by a previous attack of the distemper — if the air be pure, dry, very cold, or very hot — if, in short, the circumstances favouring the extension of the malady are not present, then the occasional appearance of it (as in the instance of small pox occurring in solitary cases when it is not epidemic) is said to be sporadic or endemic; but when various filiations of the distemper are traced from the person or persons first infected, to various streets, or to distant parts of a town — when a person becomes infected in a particular house, and the attendants or friends from different parts have left him, and convey the distemper to their homes and to their attendants, and these latter to others, then, according to the reporters of the Academy and many of the French-Egyptian physicians, a "*foyer epidémique*" is kindled, and is breaking out in various places. A poor devil of the rational school of physic may have some idea of the manner in which a humid, still air, close apartments and streets, imperfect ventilation, &c. favour the concentration of an animal effluvium proceeding from the sick, and its operation on the healthy, as well as heighten the predisposition of the latter to be infected. He even admits that these conditions may so alter the electromotive states not only of the air but also of animal bodies, and of other objects placed on the earth's surface, at the particular places where they occur, as thereby to heighten the effects otherwise produced by them. But the "foyer epidémique" is beyond his comprehension; unless it means something resembling what I have now endeavoured to explain. If it is anything else, it is only a term employed to conceal an ignorance which would have been better candidly confessed. One thing cannot be disputed, and this is, that the "foyer épidémique" plays a very harlequin part; it is here, there, and everywhere, but not at the same time, at least at first. It exists in a given circumference, and not in the centre; or in certain radii, and neither at the centre nor at the circumference; and yet it admits not of recognition but by its effects. It is the supposed source of plague, of pestilential cholera, and of pestilential yellow fever — these three great pestilences being very generally attributed to this cause by our neighbours. Now as there are three pestilences, there must necessarily be, according to this view, also three different "foyers épidémiques;" for each specific malady must have a specific "foyer" for its source. Without, however, inquiring into the origin and nature of these "*foyers*," — for such inquiry is never thought of by them, it being quite sufficient to assume their existence — it must be inferred that they are most unaccountable things, seeing that they possess neither length, breadth, nor thickness, nor other material characteristics, and yet produce material effects; that they are neither recognised nor recognisable, and yet they destroy large portions of the human race; that their existence is an hypothesis, a supposition, and yet they produce ruin and devastation; that their hypothetical presence is only for a few weeks or months, and then, after many hundreds of years, never again to return, or then after short intervals, according to the manner of their reception. How very odd is their occurrence! In one year there was a "foyer épidémique," viz. that of pestilential cholera, which visited the countries of the Levant, and, amongst very many other places, Paris in particular, where the doctrine of "foyers" is so much in vogue; yet, in the following two years another "foyer épidémique," namely, that of plague, followed the one of pestilential cholera, the latter emulating the former in its destructive powers, as if enraged at the usurpation of a "foyer" never before known. — Believing that there are certain conditions of the atmosphere favouring more or less the spread of infectious diseases on the one hand, and restraining it on the other, I cannot subscribe to the all-efficient and absorbing "*foyers épidémiques*" of our neighbours, nor attempt to shelter my ignorance by a constant recurrence to a term, which either means something appreciable and determinate, as in the light in which I would view it; or which is any thing or nothing as it may suit an hypothesis, subserve a purpose, conceal a sophism, or mask a design.

countries. In tracing the filiations of this influence according to these writers, numerous and singular vagaries are usually observed, especially as respects its attachment to certain persons and places, and its aversion to others. These filiations proceed sometimes in a hop, step, and jump manner, and straight ahead; then zig-zag; now circuitously, next centrically, afterwards eccentrically; but in whatever way they shoot forth, they show a remarkable respect for certain places and persons, more particularly for those who shut them out or who keep out of their way. Now, instead of attributing, with the abettors of the all-sufficiency of epidemic influence, the oddities so remarkable in the spread of this pestilence, to this influence solely, I consider that, when viewed in a proper light, there are neither vagaries nor oddities to be recognised; but merely the communication of the infection from person to person, favoured by proximity, and a temperate, humid, and still condition of the atmosphere; and that places and persons are exempted from it, according as the former may shut it out, or be out of its way; as it is conveyed in the person or in the clothes worn by the infected, or as the latter may be protected by a former attack, or be but little susceptible of the infection.

87. Much of the scepticism, which has recently appeared in the East, as to the infectious nature of this pestilence, is to be attributed to the preconceived ideas entertained by the young French and Italian surgeons and physicians who have entered into the service of the Pacha of Egypt, and who have thought it a most distinguished feat to brave the dangers, as well as to oppose the doctrine, of contagion and infection. The experienced Dr. GRASSI states, with reference to this fact, that the champions of non-contagion disseminated an error which soon brought destruction on themselves and on many who had communication with them; that, in 1843 — a year in which the distemper does not appear to have been very prevalent, unless in Cairo — numerous instances of contagion were furnished in some of the provinces of lower Egypt, of which he adduces a few, showing the consequences of a disbelief in this property, on the part of those who ought to have known the truth and to have acted accordingly; that, owing to this cause, the plague was introduced into several regiments, the surgeons of which were anti-contagionists; and that those surgeons and many of those committed to their care were thereby sacrificed. Dr. MARESCHI, he adds, physician to the 5th regiment, fell ill and died at Mansour. He was attended by Dr. CERTANI, of the 3d regiment, and the plague commenced in both regiments. The apothecary became infected and died. Dr. CERTANI persisted in denying the infectious nature of the distemper, and purchased the carpet used by an officer in his regiment who had died of it. He slept on this carpet, but he never again arose from it. Dr. BOUTEILLE, of the 4th Cavalry, attended Dr. CERTANI, the apothecary, and his wife, who had all died of the plague, was congratulating himself on his escape, when he was attacked and died. Dr. VALENCOGNE, who had succeeded Dr. MARESCHI at Mansour, and who was also a non-contagionist, having acquired some things which belonged to, and had been used by, Dr. BOUTEILLE, would not attend to the recommendation of purifying them before using them, and he fell a victim to his incredulity. Dr. ROSSI, of the 7th regiment, was attacked by the distemper and recovered. This young physician, two years before, had written a memoir against the infectious nature of the plague; but he afterwards changed his opinion. Four apothecaries, of whom three died, and most of their families, in all twenty-three Europeans, nearly all those living in the province, were thus sacrificed.

88. Numerous other instances of the communicability and importation of this pestilence, have been adduced by Dr. GRASSI, from his own observations in Egypt, Syria, and Palestine. My limits admit not of a further notice of them; but they may be found in the Report of the French Academy of Medicine. He concludes as follows: — 1st. That the plague is a disease entirely *sui generis*, possessing characters which are proper to it, and which distinguish it from all other maladies. 2d. That it is transmissible and transportable, and consequently eminently contagious. 3d. That its origin, like that of some other contagious diseases, is unknown; that it is not reproduced *de novo*; but that its seminium is preserved in one or other province or provinces of Turkey — sometimes in one, at another time in another. 4th. That, like small-pox, it very rarely attacks those persons who have been previously infected by it; and if it does, the attack is slight. 5th. That it prevails chiefly in temperate climates. And 6th. That if it were combated and restrained in all directions, it might be ultimately suppressed, if the ignorance and fanaticism of some people would not oppose the attempt.

89. M. LACHÈZE states (*Rapp. de l'Acad.*, &c., p. 567.) that he arrived in Alexandria during the prevalence of the plague there in 1834, and that he proceeded soon afterwards to Cairo, where the distemper broke out on the 2d of February, 1835, and became remarkably destructive. MÉHÉMET ALI shut himself up in the palace of Schoubra, with 300 persons composing his suite, and surrounded it with a double cordon of troops. Three persons only were seized with the early symptoms of plague, and they were instantly dismissed. Captain VARIN, who commanded the School of Cavalry, informed Dr. LACHÈZE that 515 persons composing it were subjected to strict seclusion under his orders; that during their seclusion, they enjoyed the same diet, regimen, and exercises as before; and that in the four months, during which the quarantine lasted, no case of serious disease and none of plague occurred among them. Captain VARIN adds, that the town of Gizeh, in the midst of which the School of Cavalry was placed in quarantine, experienced a greater mortality in proportion to its population than even Cairo, in which one-third of the inhabitants died, and yet strict seclusion in that town was followed by the most complete protection. Surely, if the disease was so entirely dependent upon epidemic influence, as contended for by the anti-infectionists, it should have appeared amongst the persons secluded in this instance, seeing that they were surrounded by this, to their minds, all-powerful influence.

90. M. DE SEGUR DUPEYRON, secretary to the Superior Council of Health, (*Rapp. de l'Acad.* &c., p. 593.) states that during his several mis-

sions, he has visited nearly all the places in the East and in Africa where the plague has appeared, with the view of determining its origin in those places; that his researches have proved that this distemper has generally appeared in consequence of scarcity following too great or too low a rise of the Nile; that the occurrence of this pestilence in Europe, especially in Venice, Trieste, Livournia, Genoa, and Marseilles, before the formation of quarantines, was frequent and always connected with the prevalence of it in the Levant, especially during peace, when communication was unrestricted and frequent: that from 1721 until 1830, the plague has been imported thirty-three times into these ports, by means of vessels which have been detained in quarantine; and that of these thirty-three importations, eighteen came from Egypt: that this distemper was not constant in Constantinople until after the conquest of it by the Turks, when it became frequent, and at last almost permanent, owing to the return of numerous pilgrims from Mecca in vessels, which, with the pilgrims themselves, were often infected: that he has seen the pilgrims arrive in small crowded vessels in a frightful state of dirt and disease; but that the plague has scarcely appeared in Constantinople since 1837, when quarantine and sanitory establishments were formed in that city: and that the plague is endemic in Egypt; but that it is not endemic, although frequent, in Syria, Constantinople, and Barbary. M. SEGUR concludes with some apposite remarks on its contagious nature, in which he firmly believes, both from his own observation and the evidence of others. He considers that this pestilence will never be arrested in its progress, unless it be rigorously treated as contagious, until it has destroyed all those susceptible of infection, or until the temperature and state of the atmosphere become unfavourable to its further extension; and he refers to the very decided measures adopted by General MAITLAND, who on four different occasions—in Malta, Gozzo, Corfu, and Cephalonia—put a stop to the distemper by a strict system of separation and seclusion. M. SEGUR adduces numerous instances of passengers and other persons detained in quarantine in various ports, who were seized with the plague on opening their trunks and exposing their clothes to the air, the distemper extending to one or more of the health-guards. One or two of these instances is sufficient for my argument. In July, 1832, some passengers from Constantinople and Scio, where the plague was prevailing, were landed at the Lazaret of Syra. On the sixth day after their entrance they opened their baggage, and eight of them were soon afterwards attacked, and six of them died.

91. A Greek vessel arrived at the Lazaret at Venice, in 1793, from Syria and Napoli de Romana. This vessel received on board, in Syria, a supply of five sailors. Four of them left the ship in the Morea, where they brought the contagion. One only, named Apostoli, remained when she arrived in quarantine. After unloading the cargo, which was not considered capable of conveying contagion, the sailors opened their chests and changed their clothes. Apostoli was first attacked. Twenty-one were infected and sixteen died in the lazaret. Of the health-guards eight were attacked and three died. In 1818 the plague appeared in the same lazaret, on board of a ship which had only two days to complete the quarantine. A passenger who had not opened his trunk until then, was soon afterwards seized, and died in two days. His health-guard was next attacked, and also died.

92. Dr. MORPURGO (*Rapp. à l'Acad.*, p.609.) resided eight years in Egypt, Syria, and Turkey; and was charged, in 1829, to organise the central hospital in Cairo, by the Pacha. In April, 1831, he quitted Alexandria and went to Constantinople. On his arrival there were no cases of plague in the city; but cholera prevailed. Subsequently a Greek vessel arrived from Cyprus with the plague, and the distemper soon afterwards appeared in the Greek quarter of the city. Dr. MORPURGO left Constantinople and arrived at Smyrna in April, 1832. The plague had not appeared there for several years, but the pestilential cholera had made great ravages. Soon after his arrival in Smyrna he was charged by the European inhabitants to organise a house of refuge for the poor of all nations and of all religions; and was brought in constant communication with the poorer classes. But until the month of May, 1833, he did not meet with a single case of plague; proving that this malady is not endemic in this port. During the five years that he passed in Smyrna, he observed four epidemics of the plague. The first appeared in May, 1833. The distemper was introduced by a vessel whose crew and passengers were landed and placed under tents whilst the process of purifying the vessel was proceeding. Dr. MORPURGO traces the several filiations of the infection until the cases became numerous. It would appear from his details that, during the winter months of 1834, 1835, and 1836, the distemper lurked in this city, appearing during the spring, and becoming more and more prevalent until the spring of 1837, when it became very fatal, and many of the wealthier inhabitants either fled from the city, or placed themselves in strict seclusion. During this most severe epidemic the plague made the earliest and greatest ravages in the most airy and cleanest quarter, and the latest and the least, in the closest, the most dirty, and the most miserable district. During these epidemics, or rather epidemic—for the disease was introduced and continued for four years, slumbering for certain periods, and breaking out, and prevailing more or less during others, according to circumstances, which wil be explained in the sequel—several occurrences were remarked by Dr. MORPURGO deserving notice. A Dr. JUSTINIANI, of the Faculty of Paris, arrived at Smyrna, and saw neither contagion nor infection in the plague, or nothing else than a gastro-enterite. He was soon afterwards attacked and died in three days. The Prussian Consul shut himself up with his family, and had recourse to the strictest precautions; nevertheless, a chambermaid was attacked, and confessed, when near her end, that she had received through a window linen from her lover to wash, who lived in an infected quarter, a circumstance proving the difficulty of preserving a strict seclusion in cases even of the most imminent risk. In the most unhealthy locality of the city, where several drains and sewers meander through margins of filth, a barrack is situated containing from 1200 to 1300 troops. The physician advised

the colonel to adopt the most rigid quarantine; and it was strictly observed. Not an individual was attacked, although the distemper was raging around them: and during their seclusion they had the same food and rations as before and after. All the convents, which observed seclusion, were completely protected; as also was the College, although situated in an unhealthy locality. The Greek and Catholic sick, not infected by the plague, were received into the same hospital with plague cases, but in different wards; none of them caught the distemper, a circumstance which Dr. MORPURGO considers a strong proof of the spread of the malady by contagion, and not by infection. He concludes his communications to the Academy by stating his conviction that the plague is not peculiar to any particular locality; that it is propagated by a seminium or germ, distinct from any other, and resembling those of syphilis and small-pox; that it always proceeds from and perpetuates the same distemper; that the isolation of the sick is the only protection; and that three things are necessary to the spread of the pestilence—namely, its seminium or germ, a favourable state of the atmosphere, and susceptibility of infection.

93. Amongst the most experienced physicians who have communicated to the Academy the results of their observations, Dr. GAËTANI may be adduced. He is first physician to the Viceroy, and has resided many years in Egypt. He states (*Rapp. à l'Acad.* p. 627.), that from 1825 until 1834 he met with no case of plague in Egypt; but that since 1834 this pestilence has appeared in a great number of towns and villages of Lower Egypt, and has occurred in many of these places during the months of September, October, and November, generally sporadically or in isolated cases; that it becomes epidemic in January and February, and subsides in June; and that he has not met with the distemper in Upper Egypt, but that during the epidemic of 1835 several cases arrived at Syouth, Fayoum, Cosseir, and other towns in Upper Egypt, without propagating the malady. During the epidemic of 1835, he states that more than fifty of the principal families of Cairo put themselves in quarantine, either at the desire of the Viceroy, or from their own conviction of its necessity; and that not a case of the plague occurred in more than three or four of these families. When a case appeared in a house placed in quarantine, it was always found that some suspicious circumstance or communication had taken place. In the palace of SCHERIB-PACHA two compartments existed, one for the men, the other for the women. In that for the men, who communicated with the city, many cases occurred, but in that of the women, which was strictly secluded, not a case was seen. At the commencement of the epidemic in Cairo, this city had a garrison of 22,000 troops, independently of 2000 invalids. These last alone were left to guard the city, and the troops were placed under tents, in an intrenched camp; and although this camp was only a quarter of a league from the city, the plague did not appear among them; whilst it carried off one half of the invalids who remained in the city.

94. Dr. GAËTANI adduces in proof of the transmission of the pestilence by clothes, the fact that there existed at Rosetta a magazine of effects belonging to plague patients. This magazine was opened after two years, and three persons were seized with the distemper, although the town was in a most salubrious state, but they did not communicate the malady to others. He believes that the effects of plague patients will convey to a distance the malady, when the circumstances favouring infection are present; that the beds, bed clothes, and body clothes of the infected are most to be dreaded; and that merchandise never or very rarely transmits the disease. He also thinks, that the pestilential miasma, during the prevalence of the malady, in a close, low, wet and thickly populated locality, may accumulate in the humid and still air to such an extent as to transmit the distemper without any nearer or personal communication; and that it is to this contamination of the air, by the effluvia of the sick, that the extension of the pestilence to houses in which strict seclusion had been observed is to be attributed; for the state of the locality, the narrowness of the streets, and the circumstances just stated, in all such instances, could sufficiently account for the occurrence, without referring it to clandestine intercourse.

95. I believe that I have now adduced sufficient evidence of the infectious nature of the plague — infectious by direct or mediate contact, or by a humid air, conveying the pestilential miasma. I might have adduced ten times more evidence of the matter; but my limits will not permit me to do that which will appear to all candid minds as altogether unnecessary. There are, however, certain topics connected with the subject that yet require further notice, in order to complete the full consideration due to it.

96. *C. The propagation of this distemper by inoculation* has been believed by some to be an important and necessary part of the evidence of the contagious nature imputed to it. But this proof is neither necessary to the completeness of the evidence required, nor is it of importance in this or in any other respect. There is almost no other febrile disease, besides small-pox and cow-pox, that admits of certain communication by inoculation. All other infectious maladies have presented only a few contingent and doubtful instances of infection by this method. As respects small-pox, cow-pox, and some chronic contagious maladies, we observe a specific contagious virus or secretion formed at an advanced stage of the malady, capable of propagating it, unless in those very dry states of the air, which is unfavourable to the propagation of all infectious and contagious maladies, when it frequently also fails of imparting the disease. If other secretions, or the blood itself, of a small-pox patient be used for inoculation, no more certain results would follow than those which have been observed to follow the employment of these fluids in attempting to inoculate the plague, scarlet fever, or typhus fever, or the measles. In the case of the plague, there is no consistent or specific virus or secretion proper to and characteristic of the distemper, that may be employed in this way, with any rational hopes of its perpetuating the disease. The ichor or discharge from a carbuncle, is merely contingent upon a local accident of the malady; the purulent matter from a bubo is equally such, and is chiefly met with during an early period of amendment; the blood of the infected can no more be expected to transmit the distemper, than

the blood in any other infectious disease, which has repeatedly been found to fail. Even granting it possible to procure the pestilential miasm, seminium, or matter of the plague, the difficulty would still exist as to the application of it to the frame of the healthy, in that state, and to that particular organ and tissue, by which its effects would be most certainly developed. I shall have in the sequel to infer, from the great mass of evidence I have perused, a part only of which I have here adduced, that it is chiefly owing to the pestilential miasms or effluvia proceeding either directly from the diseased, or preserved in their bed or body clothes, and given off upon their first exposure to the air, and inspired by susceptible persons, that the distemper is propagated and perpetuated. A near approach, amounting almost to contact, sometimes accompanied with contact, is often necessary to this effect; contact merely will often fail, or rather it will succeed in communicating the malady only when it is attended by the inhalation of the effluvium or pestilential miasm, whether proceeding from the diseased body or from fomites. Now, how can the same effect be produced by the inoculation of fluids, which have not been proved to possess the property of perpetuating the distemper, which, reasoning *a priori*, cannot be supposed to possess this property, and which, even granting them the possession of it, cannot be conveyed to that channel, through which the observing mind must admit the infection to be principally, if not solely, admitted and transmitted through the œconomy.

97. From this it may be admitted that attempts at inoculation must be nugatory in respect of this pestilence, as well as of the two pestilences already considered; or if any attempts to inoculate succeed, their success is liable to be imputed, as it actually has been by the anti-infectionists, to the operation of the epidemic influence, and in no way to the inoculation, the persons infected being attacked altogether in consequence of this constitution of the air, and independently of any pestilential miasm, seminium, or effluvium, proceeding from the diseased and inhaled with the air by the healthy, for the existence of which seminium I, in common with other infectionists, contend. If attempts at inoculation should frequently prove futile, it must be obvious, from our knowledge of the operations of the digestive organs, that the experiments made by certain nasty fellows, in the excess of their scientific enthusiasm, in order to show the non-contagious nature of this and the other two pestilences, by swallowing the secretions and discharges of persons labouring under these distempers, must necessarily prove still more futile, inasmuch as no effects beyond nausea or vomiting could be expected from these experiments. Indeed, it is most probable that the extent of the probable or possible mischief was clearly seen, and safely, as well as most courageously attempted by these experimenters.

98. However, the attempts at inoculation which have been made require a still more particular notice. M. DESGENETTES, finding the French troops in Egypt much depressed by their dread of the plague, attempted to inoculate himself with the distemper, but to secure himself from risk, he afterwards washed the part with soap and water; and according to his own statement, he not only used this precaution, but he employed "the pus of a bubo of a convalescent patient"—using, in fact, the matter of what had become a healthily suppurating sore. Soon afterwards, Dr. WHYTE, an anti-contagionist, in the English army, hearing of this feat, but not of the precautions which had been taken, repeated the experiment in a much more efficient and dangerous manner. "He rubbed some matter, from the bubo of a woman, on the insides of his thighs. The next morning he inoculated himself in the wrists with matter taken from a running bubo of a sepoy." This was done on the 2d and 3d of January, 1802, and on the 6th he was attacked with rigors and other febrile symptoms, succeeded by heat and perspiration, much affection of the head, tremor of the limbs, a dry, black tongue, great thirst, a full, hard, irregular pulse, great debility and anxiety. He still persisted that the disease was not the plague, and would not allow his groins and armpits to be examined. He became delirious on the 8th, and died on the 9th.

99. Dr. GOOCH, in his paper on the contagion of the plague, has stated that Dr. VALLI, an Italian physician who resided some time in Turkey, made some experiments on the inoculation of the plague. He diluted the pestilential matter with small-pox matter, with oil, &c. This compound he called his pommade. If a Mussulman came to consult him for an ophthalmia, he ordered him some of his pommade to rub on his eyelids; if another came, complaining of pain in the bowels, he ordered it to be rubbed on his belly. In this murderous way he gave, it is said, the distemper to thirty persons. The Turkish government at last arrested the pharmacopolist who vended the pommade, and cut off his head, but Dr. VALLI escaped.

100. Dr. L. DELAPORTE states, in a memoir addressed to the Royal Academy of Medicine in Paris (*Rapp. à l'Acad.* &c., p. 321.) that Dr. GAËTANI-BEY communicated to him the fact that a person in Cairo having persuaded several of his acquaintances that he would protect them from any future attack of the plague by inoculating them with the sanies taken from a person recently dead of the distemper, found no less than eleven who, with himself, submitted to the experiment. They, however, were all attacked, and died, the experimenter himself only escaping, but he was not altogether recovered when Dr. GAËTANI saw him.

101. It might be supposed that these experiments are tolerably decisive, not only of the contagious nature of the distemper, but also of the great probability of the communication of it in its most deadly form, by inoculation. Yet the anti-contagionists will nevertheless contend that the individuals thus inoculated and killed by the experiment were actually not inoculated with the distemper, but were all attacked by the epidemic influence, which alone produced the disease of which they died! This mode of accounting for the result in no less than twelve instances, although admitted to have occurred at a time when the distemper was prevalent, shows the shifts to which the supporters of this doctrine resort to evade a most conclusive piece of evidence, happily furnished by a most respectable physician, although the experiments were as happily not performed by a medical practitioner. Now, the supporters of the all-powerful epidemic influence in the propagation

of this distemper allow, that in Egypt the plague is epidemic only from February to the end of June; and as Dr. WHYTE's inoculation of himself (§ 98.) was performed on the 2d of January, his infection in consequence, therefore, could not be imputed to this influence, for it had not then commenced, but to its right cause, the inoculation. Now, seeing the disease actually follows inoculation in some instances (of which I have adduced only a very few out of the many which I have seen recorded), although it fails in others, and may be expected to fail for the reasons stated when commencing the consideration of the topic, there is nothing that can be reasonably desired further to prove the *contagious*, as well as the *infectious nature* of this pestilence, according to the meaning which I have fully and explicitly applied to these terms at the setting out (§§ 58, 59.).

102. The immense importance of the various topics connected with the contagious nature of plague, will not admit of my relinquishing the consideration of this part of the subject without noticing certain of the conclusions at which the commission of the French Academy of Medicine has arrived. The necessity of making some alterations in the quarantine laws, without endangering the safety of the community, especially during the now more frequent and more rapid communications between the several ports in the Levant and the south of France, induced the French Government to refer the subject to the Academy, who appointed a commission, whose report is now before me. It is most likely that much of this report will be used by the anti-infectionists in support of their arguments, not so much for the facts and evidence which may appear to favour their views, but for the use of terms to which this commission has attached a different meaning to that which is applied to these terms in this country. In noticing, therefore, somewhat further certain topics connected with the *origin* and *propagation of the plague*, I shall make some remarks upon this laboured, but not very perfect performance.

103. *D. Of the origin of plague* nothing can be asserted with any degree of certainty. The earliest indications of its existence have been already noticed, and its antiquity shown (§ 4.); but whether or not it has always been, from the remotest period of its existence, propagated by a certain germ or seminium, *sui generis*, conveyed from one part to others, more or less distant, by persons or clothes, preserved in some one or other of the countries of the Levant, prevailing in some places, then subsiding, sometimes smouldering on with few or scattered cases, at other times breaking out into more open combustion as circumstances fanned the fire; or whether it has been produced, *de novo*, on several or many occasions, and whenever various local circumstances have arisen to generate it, are questions which have not hitherto been solved, although severally entertained by numerous observing and experienced physicians. The proposition involved in the first alternative has received considerable support from the investigations of Dr. RUSSELL in Syria, who completely established the fact, that a *second attack* of plague amongst the thousands of cases comprised by his researches, is of much rarer occurrence than a second attack of small-pox. Having established this most important fact, which subsequent researches have fully confirmed, but which the commission has entirely disregarded and never mentioned, a very convincing proof is thereby furnished of the contagious nature of the distemper, as well as a strong presumption of the truth of that proposition; the plague thus appearing in the same category with small-pox, hæmagastric pestilence, &c., and the same arguments which were employed when discussing this question in respect to that pestilence being equally applicable to this. (See PESTILENCE-HÆMAGASTRIC, § 125, *et seq.*).

104. *α. The protection furnished by a first attack* being thus established, with but very few exceptions, it must be obvious to the candid inquirer that numerous occasions will occur, in the countries of the Levant, in which a very large proportion of the inhabitants is protected by a previous attack; and that the spread of the distemper will often be limited by this cause, aided by others connected with the temperature and states of the atmosphere. This fact will also explain the occasional failure of the very imperfectly informed and inexperienced experimenters among Egypto-European physicians to communicate the distemper by contact and inoculation. Thus it will be found, in the report to the Academy, that a felon having been made the subject of inoculation in Egypt, caught the distemper and recovered. Having thus earned his life, he was nevertheless experimented upon subsequently, and not being re-infected, the circumstance was adduced as a proof of non-contagion, although actually being, to the mental vision of all who can see, and duly estimate the most prominent and important truths in medicine, the strongest evidence which could be brought in aid of the opposite and orthodox doctrine. But there is every reason to believe that, as in the cases of small-pox and the hæmagastric pestilence, the infection of plague may be so mild, the febrile disturbance so slight, the pains in the glands so evanescent, and the swelling so small, as to almost escape notice, or to pass away without recollection of the disorder, and without knowledge, or even suspicion, of its nature. Indeed a very mild grade of the distemper has been described above (§ 21.), and is frequently remarked, when this pestilence has been introduced into a crowded city or place. Protection from second attacks may thus become much more numerous than actually apparent from this cause.

105. *β.* The *second proposition* involved in the alternative stated above (§ 103.), namely, *is the plague generated, de novo, whenever circumstances favourable to its generation arise?* is answered in the affirmative by the Academy. It would have been instructive, probably most beneficial, if the French commission, during the long period they have taken to consider the matter, had ascertained the several circumstances which combine to generate this pestilence, *de novo*, and distinctly stated them, before they took the proposition for granted, and proceeded to reason upon it as an established fact; the more especially as it has been controverted by the ablest writers on the distemper, and doubted by many. But the commission adopts an easier course, and without any such preliminary and fundamental inquiry, asks themselves the question, — *What is the place or places where the plague has arisen spontaneously?* And, after

taking a very round-about way of answering it, they state, without any doubt or reservation, "that the plague has been generated spontaneously not only in Egypt, in Syria, and in Turkey, but also in a great many other countries of Africa, Asia, and Europe." The spontaneity of plague, according to the commission, is thus tolerably latitudinarian, but many will doubt, notwithstanding the greatness of the authority, the wideness of the range, even if they do not dispute the accuracy, of the principle adopted. Certainly the question of the origin of this pestilence cannot be readily or easily answered, especially by one who is cognizant of the difficulties which beset it, and of what may be said for and against the doctrine of spontaneity. I confess that I cannot arrive at a positive conclusion as to the matter. There are many circumstances which favour the opinion and many which militate against it: first of the former.

106. Of all cities or places Cairo furnishes the most numerous circumstances conducive to the production of this pestilence *de novo*: a crowded population in dirty, close, and ill-ventilated chambers, especially in the Coptic quarter; narrow streets, with open sewers in many places, and abounding with filth; the accumulation of decomposing animal excretions and exuviæ; a rich deep soil, saturated with animal matter; low, close, dirty, and ill-ventilated habitations; the burial of the dead within the walls of most of the Coptic habitations; contaminated and unwholesome water; adjoining inundations; great humidity of the air during part of the year, and a temperature from 50° to 75° FAHRENHEIT, are a combination of conditions sufficient to generate a pestilential malady, or, at least, a putro-adynamic form of fever, especially when they exist in marked grades, or are aided by scarcity of food, by great humidity and stillness of the air, and probably also by a negative state of the electro-motive agency in the atmosphere and on the earth's surface. If these do not actually give rise to the pestilence, without any pre-existing germ or seminium, they may be inferred, at least, to be most influential in developing, propagating, and even in perpetuating such germ; and in giving rise to a susceptibility or predisposition of the population to be infected by it, as far as these favourable circumstances extend, and amongst all who are not protected by a previous attack or by other causes.

107. Dr. LEGASQUIE, the member of a commission which visited Egypt in 1828, 1829, and 1830, to investigate the causes of plague, and to try the action of the chlorides on the pestilential miasm or virus, believes that, although the plague existed before the sixth century, it became more frequent in Egypt in consequence of the practice of embalming the dead having been relinquished after the introduction of sepulture by the early Christians, and that it is endemic in Lower Egypt. He considers that the practice adopted for so many ages in the Coptic quarter, which is situated in the centre of Cairo, of burying the dead within the houses, exerts a powerful influence upon the health of the whole city. There can be no doubt of this, especially aided as it is by numerous other circumstances of an injurious tendency, the chief of which have been already enumerated (§ 106.), and he imputes the origin of the plague to animal decomposition; want of cleanliness, scarcity, poverty, the inundations of the Nile, ruinous state of the canals, and insufficient ventilation being only accessory causes. (*Rapp. à l'Acad.* p. 590.) The same opinion is entertained also by several of those who have communicated on the subject with the French Academy. M. DELAPORTE, in a very able memoir, attributes the development of the pestilence to the same causes; but admits that when thus produced, it perpetuates and reproduces itself — 1st, By pure contagion, or immediate cutaneous contact; 2d, by infection or internal pneumogastric contagion. It cannot be doubted that, if we admit the spontaneous generation of the pestilence on occasions when all the circumstances concur most efficiently to this effect, that the towns and villages of Lower Egypt furnish them in the most marked degree; but it cannot be also admitted that they stand alone in this respect, for many towns situated near the shores of the Mediterranean present conditions almost as favourable to the production of this effect as those of Egypt.

108. In opposition to the doctrine of spontaneity it may be contended, seeing that the circumstances that combine to generate it, according to this view, must necessarily exist in many places and towns in other countries enjoying the same range of temperature as those of the Levant, and in many cities in Western Europe during the warmer seasons, that this pestilence ought also to be generated in countries eastward of Arabia, as well as in some parts of America. Those who believe that it is propagated by a seminium analogous to small-pox, but not capable of being so long preserved as that of small-pox, are of opinion that the circumstances favourable to, as well as the occasions of, the conveyance of this seminium to the eastward of some parts of Arabia, and to the westward of Europe and Africa, have not existed; and that when this distemper has appeared, as it has on rare occasions, in some of the northern cities of Europe on the one hand, and in some of the hot countries of Africa and Syria on the other, it has always spread by the contagion and infection conveyed by persons and the clothes of the sick; but that the low winter ranges of temperature in the former, and the high ranges of the summers of the latter, have always destroyed the poisonous seminium, either by the influence of the extremes of temperature upon it, or by the loss of the power of perpetuation after a certain period.

109. That those very circumstances and occasions which would appear the most favourable to the production of this pestilence *de novo* have often not produced it, even in countries where the pestilence is met with sporadically, and is considered as being endemic by many writers, is a fact which has been demonstrated, and which militates strongly against the doctrine of spontaneity, but which supports that of a specific seminium; for, on these occasions, the absence of this specific contagious or infectious agent accounts for the non-appearance of this pestilence; other maladies, which these occasions generally produce, being the only results. Thus it is stated by Dr. ROSSI, that when the Egyptian army were in Syria they were exposed to many of the circumstances supposed to originate the

plague, and especially when obliged to evacuate the country they were crowded into ill ventilated transports. Malignant typhus, and dysentery, hospital gangrene, &c. then became most prevalent and fatal, but no case of plague occurred. This appeared to be the case especially with the regiment to which Dr. Rossi was attached, and which was not attacked by this pestilence until after its return into Egypt, when it became exposed to the infection during his absence, and, no measures of precaution or prevention having been taken, the distemper had become general throughout the corps. He sent all the infected (about 400) into the hospital, and caused those who appeared in health to bathe in the Nile, to put on clean and purified clothes, and to encamp on a dry and arid soil. As soon as one was attacked he was sent to the hospital, and thus the camp was preserved healthy, and the distemper ceased. Although the occasion of generating the pestilence *de novo* was most favourable in this instance, still it did not appear, until the return of the troops to a place where cases of the plague existed; the neglecting of precautions against infection having diffused the distemper, and the adoption of precautions having arrested it. When the pestilence was introduced into Smyrna, as shown by the authority referred to above, it appeared first in the most open and healthy quarter, and advanced the latest, and prevailed the least, in the lowest, most crowded and unhealthiest quarter; and this in a city supposed by some to reproduce the distemper *de novo*. Besides, it is fully shown by recent researches, and by the recent adoption of sanatory measures by Turkish and Egyptian Governments, that the more or less continued presence of cases of this pestilence was not owing so much to the existence of the local causes supposed to generate it *de novo*, as to the want of all precautions and quarantine regulations, and to the neglect of separating the infected from the healthy, whereby the specific infectious seminium was preserved and propagated.

110. Without, therefore, denying the frequent reproduction of the plague in Lower Egypt, by the causes stated above, still the doctrine of an original specific germ or seminium presents many considerations in its favour, and of the same nature as I have adduced when considering the origin of the Hæmagastric pestilence. According to the former view, the circumstances above stated (§ 105, *et seq.*), give rise to the sporadic or endemic cases, as they have been called, but they are insufficient of themselves to spread or to diffuse the distemper in an epidemic form, until the epidemic influence or constitution, for which certain modern writers contend—the "*Foyer epidemique*"—is actually developed. According to the latter view, the specific contagious agent produces but few, scattered and isolated cases, in certain localities and towns, as long as the circumstances unfavourable to its propagation exist, as observed in respect of small-pox—whilst the extremes of temperature, a dry atmosphere, free ventilation, absence of susceptibility in many, and cautious avoidance of crowding, and of intimate or close communication, afford protection; these straggling instances being sufficient, especially when reinforced by importations from other places furnishing occasional cases of the distemper, to perpetuate the specific agent of contagion. But when the circumstances favourable to the diffusion and operation of this agent appear, as moderate atmospheric warmth, conjoined with humidity and stillness of the air, and probably also with a negative state of the electro-motive influence, and with noxious exhalations from the soil, with crowding and close or frequent communication with the affected, then the distemper becomes more or less prevalent with the grade and combination of these and other favourable circumstances; and these alone, or chiefly, constitute the epidemic influence or "foyer," to which so much is imputed by some recent writers.

111. Now we find that the plague becomes epidemic at one year, or even during two or three successive years, in some countries of the Levant, successively appearing to a most destructive extent in one country, then subsiding, and breaking out in one or several countries; but much more rarely, or not for ages appearing in more distant countries where precautions against its ingress are taken, and never where these precautions are strictly observed. If we admit, with the anti-infectionists, that this pestilence arises from an epidemic influence alone, such epidemic influence must be of a specific kind, since it produces specific and determinate effects, and occasions neither adynamic fever, nor adynamic dysentery, nor either of the two other specific pestilences considered above; and, seeing that this pestilence migrates from one place and country to another, and is actually as eccentric in its migrations and courses as I have described it (§ 86.), the epidemic constitution to which it has been thus absolutely imputed, must necessarily be equally migratory. Moreover, as it has been most satisfactorily shown, and as sufficient evidence to demonstrate the fact has been adduced, that this pestilence may be shut out for ages from places where it was almost a yearly visitant, by strict measures of separation and seclusion; and that it may even be shut out and excluded from a house or houses, whilst all the surrounding houses are infected, how are the persons taking these precautions, I ask, enabled thus to prevent the epidemic influence to which it is imputed from occurring in the town, country, or place from which it is excluded? And if the town or place be invaded by this aërial influence, how are they able to shut it out from any house, or part, in which neither infected persons nor infected clothes are allowed to enter? The persons taking these wise precautions are admitted to be quite incapable of keeping off a single shower of rain, by all the scientific means they can use, how comes it, then, that they can prevent a most destructive epidemic constitution of the atmosphere from visiting a country, although they profess their ignorance of the nature of that constitution, excepting from its effects; and that, when they have carelessly or ignorantly admitted it, they can, as we have seen, ward it off, and prevent its ingress into any house they please? Can any thing more completely show the absurdities of the doctrine of epidemic constitution and non-infection, than a knowledge of the facts connected with the development and spread of this pestilence.

112. The truth is, that infection is introduced, however it may originate, by persons or clothes, or by both, in a town or place; and if the conditions favourable to its communication to susceptible

persons are present—if the temperature be in neither extreme, or be moderately warm; if the air be humid and still; if the houses are crowded, low, damp, and ill-ventilated, the streets narrow and abounding in filth; and if the communications be frequent and a large number of the population are susceptible, owing to their not having been previously attacked, or to some other cause, constitutional or otherwise, the pestilence soon spreads and becomes epidemic. These circumstances conjoin to constitute the epidemic constitution—the "*foyer epidemique*" of our neighbours, to which they impute the pestilence. But I contend that they are merely the conditions—the circumstances which favour the operation, spread and reproduction of a poisonous agent—of the pestilential miasm or infectious emanation produced by the infected. As soon as these conditions and occasions disappear—as soon as the temperature sinks to freezing, or rises above 75 deg. of Fahrenheit, and more especially if the air becomes at the same time dry, if high winds occur, and free ventilation in houses or tents is adopted, the infectious poison ceases to be concentrated, is more diffused in the air, and is less capable of reproducing itself, by infecting others, from its being weakened or otherwise changed, and from its ceasing to affect persons who have become, owing to these atmospheric conditions, much less susceptible of its operation, then as soon does the pestilence subside and entirely disappear; unless it be allowed to smoulder on in low, dirty, close, damp, and crowded places, furnishing a few of the circumstances favouring its occurrence, and some persons still susceptible of its action. Thus in Levantine countries, the distemper is said to be endemic or sporadic, occurs in isolated cases, and is ready to become epidemic as soon as the circumstances combine to favour its diffusion. The dose of the infecting poison in the former or favourable circumstances is large, strong, and efficient, and the recipient susceptible of its influence; in the latter, or unfavourable conditions, it is small, weak, and inoperative, and the recipient insusceptible of its impaired power. What has now been stated of the infection of this pestilence does not pertain to it only, or to two or more pestilences merely, but is true of all other maladies of a malignant and epidemic nature, especially of the two other pestilences, of small-pox, and of the other exanthemata.

113. iii. *The arguments which have been used by the anti-infectionists to support their doctrine*, hardly deserve any notice, after the ample evidence—after the undeniable facts, I have adduced, completely proving that the three pestilences here considered are infectious in a most remarkable manner, under circumstances which are fully described. As the arguments which have been used by the objectors are the same as respects these three distempers individually, I have deferred the consideration of them until all the three have been brought fully before the reader. I even hesitated to consider these arguments at all; because, when a matter is fully and irrefragably established on facts, any argument which can be brought against it—all special pleadings, however ingenious, argue either the fractious spirit of the objector, or some motive actuating him to prevent a belief in the truth. On this account, therefore, the arguments—or rather the sophistical puerilities, which have been adduced by ignorant, interested, or captious and splenetic persons, hardly deserve a notice, and only when they seem to possess an air of importance—an importance derived only from unwarranted assumptions, confident assertions, and ill-founded pretension; and, in some instances, also from the official or professional position of some of those who have ventured into the field of controversy,—and not from any solid array of facts or of inferences logically drawn from facts. But irrespective of the want of every element of sound argument, a very large proportion of the Anti-infectionists betray, as shown above, an utter ignorance of the distempers respecting the nature of which they speak with confidence, and even with disgusting pretension—and not only of these distempers, but even of others, either allied or analogous to them, of which they have incidentally taken notice. This assertion may be conceived by some, who have not had opportunities of judging for themselves in the matter, as severe or ill-founded; but it could be very easily proved if it deserved the space, which would be wasted in proving it. Whoever has perused some of the writings to which I allude, and which I have referred to, or others which I have considered undeserving of notice, with that amount of knowledge which enables him to form a tolerably correct estimate of medical writings, will readily admit the accuracy of the assertion: and the attentive reader of what has preceded, and of what has yet to be adduced, will find sufficient reason to arrive at the same conclusion:—

114. *A*. It has been argued by the anti-infectionists, that the three pestilences now considered, are not governed by the laws of contagious, but of epidemic, diseases. Now this assertion shows, even of itself, that those who make it know nothing of these laws, and still less, if less be possible, of the matters respecting which they attempt to argue. What is there known of the laws of infectious disease which these pestilences do not actually possess and present? The chief law, admitted even by the objectors, is, that contagious or infectious diseases present precise, specific, and distinctive characters. Has not the whole history of the three pestilences now considered demonstrated the possession of these very characters by them in a most remarkable manner? Is even small-pox more distinctive or specific than they are all? Is there any one at the present day, who has had the smallest amount of experience, who will not admit the special character of these distempers, unless he be blinded by ignorance or prejudice, or by both, for they are both often combined? But the anti-infectionists say, that other maladies, admitted by them to be infectious, affect a person only once in his life, but that this is not the case with the pestilences now described. Here, again, their ignorance, or their dishonesty, is most barefaced and egregious; for they should know, if they really do not know, that a second infection is even more rare, as shown by facts out of number, as regards two out of these three distempers, than even the exanthematous fevers, whose infectious nature they admit; and that opportunities have not yet been afforded, at least in Europe, to test a similar property in the third of these distempers. In truth, there should

be an end of all argument with such persons, as being unworthy of the distinction conferred by fair argument; for they will neither see, nor acknowledge, nor appreciate fairly, any fact which may be construed unfavourably to their views: but will endeavour to controvert it by mis-statements and drivelling doubts, when they find it to be otherwise unassailable.

115. Oh! exclaim these pseudo-philosophers, who wish to make infection appear a prejudice, a vulgar error, and who, in the fulness of their vanity, desire to seem altogether above every thing that can be accounted a vulgar or general belief, these pestilences are merely epidemics, observing the laws of epidemics; and are hence not infectious. Yet what do they know more of the laws of epidemics than their opponents, who admit that these pestilences are very frequently epidemic, and are mostly known as such in Europe; but who also contend, that they are likewise met with in solitary or scattered cases, in the countries which present the climate and circumstances favourable to their preservation during all seasons; and that their occurring in an epidemic form — their more general prevalence — is only the result of the existence of the several conditions and circumstances, which admit of the concentration or accumulation of the infectious miasm, which favour the development and operation of it, and which thereby promote the diffusion of infection, especially among susceptible persons, and those who have not passed through the distemper; and still more remarkably when these are collected in numbers, or are crowded in towns and cities, or are otherwise placed in circumstances predisposing them to the invasion of the pestilential emanations from those already infected. According to the non-infectionists, the pestilential cholera was considered an epidemic depending upon aërial conditions, and was hence termed epidemic cholera. The calamitous consequences of opposing a suppositious aërial or tellurial influence, or a combination of both, — for suppositions were varied, and even numerous as to the matter, — to a manifest property of the distemper to spread from the sick to the predisposed among the healthy, like all other infectious maladies, and the confident assertions and assumptions employed to conceal ignorance, have been already beyond the power of human calculation to estimate as respects this single pestilence merely; they are still frightful and extensive, and they may even become much more so, and be indefinitely perpetuated.

116. Still the non-infectionists exclaim, these pestilences, choleric, hæmagastric, and glandular or septic, are merely epidemics, prevail only as far as the epidemic influence extends, and are the results of the "epidemic foyers." Has, however, the choleric pestilence, which has continued to prevail, more or less, for nearly thirty years in India, been an epidemic during all that time? Or has it not rather been, as I have shown, an infectious distemper preserved in that country, by the absence of all attempts to prevent infection, or to limit the spread of it, and by the circumstances of the climate, but prevailing more or less or becoming more epidemic at one place than another as occasions arose favouring its diffusion, and predisposing those exposed to it? The truth is that, when the various occasions and circumstances concur to develope lurking cases of either of these pestilences into an epidemic form, it prevails to an extent influenced and limited by these occasions and by the numbers of the predisposed within the boundaries to which infection has extended, and then subsides; sometimes having exhausted itself for want of susceptible subjects, when the circumstances favourable to its diffusion have continued without mitigation; at other times subsiding without occasioning great fatality, when these circumstances have either been but slightly favourable to its propagation, or when others have tended to arrest or limit its extension. In most countries where these pestilences prevail without attempts having been made to limit or destroy the infectious agents, they are perpetuated, by communication with the sick, and by the clothes of the infected, in solitary or scattered cases — scattered more or less profusely in some localities, and in certain seasons, than in others, — until the favourable occasions of temperature, humidity, and stillness of the air, conjoined with susceptibility and crowding of the population, have developed them into an epidemic prevalence. In other countries or climates, where the infectious agent is destroyed, or is allowed to extinguish itself by removing it from the reach o susceptible subjects, or where it dies away from the occasions requisite to its propagation being absent, the pestilence is no longer heard of for a time, until an infected person or infected clothes again introduce the distemper, which becomes more or less prevalent according as circumstances favour its spread; and thus it may prevail, then subside, extend to another place, disappear, return, and become epidemic in succession in various situations, as usually observed in respect of the plague in the Levant. The opposers of infection, — the supporters of the doctrine which attributes all the effects observed in the course of epidemic maladies to epidemic constitutions or influences merely, — to "*foyers epidemiques*," — cannot produce a single epidemic of any pestilence, the several phenomena of which can be fully accounted for by the agency or influence which they invoke, but of which they can neither demonstrate the existence, nor assign any indications of its presence, beyond the mere circumstance of the spread of the distemper from the sick to the healthy, with more or less unusual or remarkable frequency. Now the infectionists contend, that this propagation of the disease is the result of a morbid effluvium proceeding from the sick and infecting the susceptible among the healthy, all other occasions and circumstances existing at the time being only aids of this efficient cause; and they challenge their opponents to an examination of both doctrines with an honest regard to facts, more especially to those facts which are open to the scrutiny of all candid minds, and from which alone, and not from argument, the truth is to be elicited.

117. The non-infectionists contend, as a proof that pestilences are not infectious, that "they break out at a certain season, last for a certain time, and then subside and remain dormant until a favourable season returns:" whilst, on the other hand, they assert that "contagious diseases can be propagated at any time and among any number of persons;" and that "a disease depending upon a specific contagion must prevail alike in all seasons, in a pure as well in an impure atmosphere, among the rich as readily as among the poor;

and that the only influence of these adventitious circumstances would be to render the disease more or less severe." Now I have, on more than one occasion, accused the non-infectionists of ignorance of that science, with which, unfortunately for the causes of humanity, they have meddled; and some may have supposed the accusation harsh, or even ill-founded; but, can a more convincing proof of the fact be adduced, than the very arguments they have employed to support their doctrine — the very weapons which they have wielded in a conflict involving the interests of the community? Is there one medical man — one who has the smallest right to a title, which should claim respect from all well-constituted minds — who could make the assertion, contained in the latter part of the above quotation, with the least shadow of truth as regards any one disease which is either contagious or infectious? On the contrary, it is known to all, who have either observed for themselves, or read the observations of others, that all contagious or infectious maladies, propagated in the natural way, spread readily at one time, and scarcely at all at another — that hooping-cough, scarlet fever, measles, small-pox, and even rabies, are more prevalent at certain seasons, than in others, — that either of these maladies may for some time be rarely or never seen, then break out, and be more or less prevalent. There is no disease more demonstratively both contagious and infectious than small-pox, or in many respects more analogous to plague. Now let us see what was the usual mode of its appearance before it was controlled by inoculation and vaccination. Before small-pox was thus interfered with, it is well-known that it used to lie dormant, then appear, rage for a time, and then subside, like those pestilences now considered, and which have been imputed by the non-infectionists, to epidemic influences. There can be no greater authorities adduced respecting small-pox, before the introduction of inoculation, than SYDENHAM, BOERHAAVE, and VAN SWIETEN; and they describe it as appearing and running its course like epidemic diseases. SYDENHAM remarks, that "one and the same disease kills an infinite number at some certain seasons, and at another time seizes only here and there one and goes no farther; and this is very apparent in the small-pox, and especially in the plague." BOERHAAVE observes that, "this disease is generally epidemical, beginning in the spring, increasing in summer, abating in autumn, ceasing almost entirely in the following winter, to return again in the spring;" and VAN SWIETEN states, "I have seen many variolous epidemics, and they agreed in most things with the observations of SYDENHAM."

118. *B.* So much for the medical knowledge of the non-infectionists as evinced by their arguments, and on occasions when exact knowledge, and not ignorance, should have been put prominently forward. I shall next furnish an example of the "*suppressio veri*" — of the honesty of their arguments. "People are attacked," states a pillar of the non-infectious faith, "not in proportion as the inhabitants of the affected mix with those of the unaffected places; but, in proportion as the inhabitants of unaffected expose themselves to the *air* of affected places. The visits of the sick to unaffected places is [are] followed by no increase of disease; the visits of the inhabitants of an unaffected, to an affected place is [are] attended with a certain increase of sickness. On their removal from a noxious to a pure air, the sick often rapidly recover; but they do not communicate the disease to the inhabitants of a pure atmosphere." Now I can affirm, that amidst the numerous worthless statements which I have been doomed to peruse — of the multitude of medical facts or medical lies which have come before me, none has been more impertinently false than the above. The short passage now quoted conveys with its unmitigated falsehoods and bad grammar, two distinct propositions, in several ill-expressed forms: — 1stly, *That, when the people of healthy districts visit the affected districts, they take the disease not from the sick but from the air*: — 2*dly*, *That when the sick move from an affected to a healthy district, they speedily recover, and do not give the disease to others.*—These propositions are the *basis* upon which the non-infection faith reposes; and are extended by the apostles of this faith to the three pestilences which I have been considering. I shall, therefore, bestow somewhat more notice on them than they deserve, and show — what indeed most of what I have adduced in any way connected with the subject must have already shown — that they are as baseless as the visions which haunt the imaginations of the trembling and sickly drunkard, when deprived of his accustomed stimulus. Having demonstrated the non-existence of the grounds upon which a belief in non-infection is based, this most dangerous doctrine — a doctrine pregnant with the worst consequences to the community — is consequently swept away, and entirely removed from rational minds; a belief in it being merely a matter of history, and an illustration of the progressive advancement of the human mind.

119. *a.* If, according to the *first proposition* of the non-infectionists, *those who come out of a healthy into an infected district take the distemper not from the sick, but from the atmosphere of the district*, then it follows that those who avoid the sick, or the clothes of the sick, shall be as liable to the distemper as those who approach or touch them. Now is this the case with the plague, or with any of the other pestilences I have discussed? The contrary is so notorious, as to require no further demonstration than it has received in the preceding articles; and if further demonstration be required, let a mere reference to the numerous instances of the protection afforded by seclusion in the midst of an infected population, on occasions of the prevalence of either of these pestilences, be sufficient; and a sufficient number of these instances has been adduced in the course of the preceding pages to satisfy the candid mind. Let the reader peruse the facts I have adduced proving, as respects each of these distempers, that the healthy will remain protected amidst a dense infected population — whilst surrounded by the sick and the dead, — as long as seclusion, and avoidance of all communication with infected persons or infected clothes, are observed. These facts are undeniable, and are not to be assailed by the loose statements of ignorant men, expressed in the bad grammar, and worse English, indicative of minds insufficiently informed for those investigations which are necessary to elicit the truth, and to trace its relations to matters held in dispute.

120. *b.* The *second proposition*, that *when the*

sick move from an affected to a healthy district, they speedily recover, and do not give the disease to others, has been sufficiently characterised by me above (§§ 118.), and is entirely false, as may have already appeared from what I have adduced in various places. That the infected should be less severely attacked when removed from crowded, close, low, or ill-ventilated places, to dry, elevated, and well-ventilated situations, may be inferred. It is one of the circumstances most strongly insisted upon by the infectionists, with reference to the three grand pestilences of modern times; and it has been more efficiently acted upon by them than by their opponents, as demonstrated at Gibraltar and other places. But, unfortunately, numerous exceptions to the generally good effects of removal occur; for, once the infection has taken place,—once exposure to infection of a manifest or concentrated kind has occurred—a severe and fatal grade of distemper will often be developed, notwithstanding that the removal to a pure atmosphere has immediately followed the infection. Instances proving this fact are numerous and too familiar to every experienced observer, as respects the three pestilences under consideration, to require a more particular notice than that which has been already taken of the subject. It has, moreover, been shown that a more or less elevated temperature and stillness of the air are necessary elements in the development of the epidemic prevalence, of at least two of the pestilences in question, if not of all three; and, consequently it follows, that a reduction of that temperature and free ventilation will be favourable to the infected, and will be more certainly secured by removal. Hence removals, with advantages as to temperature and ventilation, will prove more especially beneficial. But it may be inferred that a removal, even to a purer air, when the reduction of the temperature of that air is slight, will not be so manifestly advantageous as when it is much more considerable. Thus it was shown, on a very recent occasion that, when the crew of the "Eclair" steam ship, the infected and the healthy, were removed from this vessel, which, according to the non-infectionists, was the cause of the disease to all those who were not exposed to malaria in Africa, and were landed at Bona Vista, the distemper was not thereby mitigated in any degree, but continued to spread among the crew, and subsequently to the inhabitants of the island.

121. The assertion made by the writer quoted above (§§ 118.), that the visits of the sick to unaffected places are not followed by the propagation of disease, is the most outrageous and unblushing falsehood which has ever desecrated medical doctrine, or disgraced medical writings,—a falsehood, moreover, which, if believed in and acted upon, would on numerous occasions endanger the lives of the majority of the community in every civilised, or even partially civilised, country. Can such an assertion deserve the least notice, after the numerous proofs to the contrary adduced in the preceding pages?—after the instances I have referred to—and thousands more might have been mentioned if my limits could have admitted them. I shall, however, notice two, which I have just seen in the course of my reading. Mr. HOWARD, in his celebrated work states, that "when the plague raged in London in 1665, the infection was conveyed by means of a parcel of clothes to the remote village of Eyam, near Tidewell, in the Peak of Derbyshire. In this place it broke out in September, 1665, and continued its ravages upwards of a year, when 260 of the inhabitants had died of it." "In the surrounding fields are many remains denoting the places where tents were pitched; and tombs are still existing of large families entirely swept away by this devouring pestilence." (p. 24.) The plague is very rarely introduced into Arabia; the passage across the desert, and the state of the climate in many parts of the country, being unfavourable to the development and spread of its infection; and it is generally admitted that the pestilence has never appeared there unless when imported, as was the case in 1815, by the army of MEHEMET ALI, which crossed the desert into Arabia on an expedition against the Wahabees. Dr. BABINGTON, the eminent physician to GUY'S Hospital, who came over land from India at this time, remarks, in a communication to Dr. GOOCH, that the plague had then visited Yambo and Jedda, and crept down the coast as far as Gamfada,—and that each of these towns had lost nearly half the population. He moreover adds that, when he was at Milo, in the end of 1815, a vessel came into the port having one person on board ill with the plague. This vessel was ordered by the Greek authorities to quit the harbour. She put into Mitylene, where those in command being less cautious, allowed the sailors to land; several of whom had, by this time, become infected. The distemper immediately afterwards broke out among the islanders, and many fell victims to it. It is unnecessary to adduce further proofs not only of the utter worthlessness, but of the insane recklessness of the assertion, which I have now sufficiently noticed. Indeed, the full evidence I have brought forward of the infectious nature of each of the pestilences considered under this head, completely overthrows the position so rashly assumed by the non-infectionists.

122. But, as shown above, and admitted by the contagionists or infectionists themselves, the plague is not always propagated; when those sick of it, or the clothes of the infected, are removed to a place or places which is altogether healthy, or free from the pestilence. This circumstance has been fully explained; but because, like all other infectious maladies, this requires certain conditions for its epidemic prevalence, and because it is not universally diffused—because it is not widely and generally propagated on all occasions and circumstances whatever, the non-infectionists raise an argument against its infectious nature. The occasions and circumstances favouring the spread of this distemper are hereafter shown (§§ 124. 127. *et seq.*), and those preventing the propagation of it also stated (§§ 126.). That there should exist such occasions, is only in accordance with the laws of nature, and with the phenomena characterising all acute infectious maladies. The same takes place in respect of the small-pox and the rest of the exanthematic, and it is notoriously the case as regards the other pestilences. Before the introduction of inoculation, small-pox, as respects its epidemic prevalence, presented the same laws as the plague and other infectious maladies which frequently appeared in an epidemic form. VAN SWIETEN, who saw the small-pox when it

was propagated only in the natural way, remarks as follows:—"I have sometimes observed large towns to be free from the small-pox, whilst it raged epidemically in the neighbouring villages; and, on the contrary, some large towns universally visited by the complaint, whilst the villages in the neighbourhood remained in health, though the inhabitants of both mixed daily with each other. I also perfectly remember, that I once removed two patients of mine from a place where the small-pox raged to a large town, without propagating the contagion there; and many excellent physicians, with whom I have cultivated a friendly commerce with respect to medical knowledge, testify, that they have observed the same thing." A similar fact is mentioned by Sir JOHN PRINGLE. He states that "the small-pox, being carried into a camp by some new raised recruits, quickly disappeared without becoming general, although it is notorious that other camp-diseases are but too apt quickly to spread themselves." Dr. ODIER, in a letter from Geneva to Dr. HAYGARTH, says:—"We have frequently inoculated at Geneva a great number of children in the years during which the small-pox was not epidemic; these children have gone out every day, even after the eruption had broken out; they have been in the streets, and in the public walks; they have communicated freely with other children susceptible of the infection, and, not only the small-pox did not spread, but there did not occur, to my knowledge, any distinct instance of the communication of the disease from one individual to another in the streets or promenades."

123. I have now taken as much notice of the chief arguments of the non-infectionists as they deserve. Who will not be convinced, by what has been adduced above, are not likely to be convinced of the infectious nature of the pestilences here considered, by any thing whatever that may be advanced. I can only add, for the consideration of the inexperienced and incautious, that, after what I have stated on the subject, with a perfect conviction of its truth, and after the fullest and most extended research it was in my power to bestow upon the subject, if they neglect those measures which are calculated to prevent infection, in the several circumstances in which it may be likely to appear and to extend—if they act recklessly, as the numerous occurrences of these pestilences have presented many examples, and despise the doctrine of infection and all protective measures, they will open the flood-gates of an overwhelming calamity, in which they themselves, amongst many others, may be swept away: or, if they should survive, they will have an account to settle with their own consciences of no small amount. At the present day, persons are endeavouring to overturn belief in a doctrine most essential to the safety of the community, and are attempting to oppose their opinions to the views and doctrines inculcated by the master minds in our science,—inculcated for the promotion of the best interests of humanity, and inculcated moreover, with a perfect conviction of their truth.

124. iii. *There are some circumstances which predispose to, and others which appear to counteract, the infection of plague*, besides those just referred to. My limits will only admit of a brief notice of them.—*a*. It has already been remarked, that extremes of *temperature* arrest the spread of this pestilence. It has long since been stated by VOLNEY and others, that the winter temperature of Constantinople puts out, but that spring and summer heats rekindle, the distemper. But it is very questionable whether or not the infectious miasm is destroyed by the cold, or is merely rendered inoperative or dormant; and although the spring and summer heats resuscitate the pestilence, it is very doubtful whether this effect is produced by the generation of the distemper, *de novo*, by the influence of a higher range of temperature upon the decomposing animal exuviæ and other materials, or whether the dormant infection is thereby rendered operative and called into activity, or even whether the infection is introduced on several occasions, and at several points, by infected vessels and travellers, and especially by the numerous pilgrims returning to or passing through this city; and that the infection spreads as soon as the occasions favourable to its extension supervene. That this last is the true reason of the prevalence of the distemper during summer in this city is shown by the almost total disappearance of it since quarantine regulations were adopted in 1839. In Cairo and other towns in Lower Egypt, as well as in some parts of Syria, where the winter temperature is much higher, the distemper becomes epidemic, or at least more or less prevalent, usually at a much earlier period of the year, generally in March, April, and May, and subsides when the temperature rises above 75 or 80 deg.

125. *b*. It is, however, not so much the temperature as the *humidity* of the air which favours the extension of this pestilence, and the former may be said to be operative only when it is conjoined with great humidity. This is evinced at Constantinople, where the air is very humid in spring and summer, owing to the influence of the adjoining seas, the extensive forests, and high ranges of mountains. In Lower Egypt and Syria, especially in places near the coast, the winter and spring are humid and rainy, and the atmosphere close and still; and although the range of temperature is not high, still the close and moist air favours the accumulation of the emanations proceeding from sporadic cases of the pestilence, or from clothes retaining these emanations, and renders those exposed to them more susceptible of their influence. When, however, the atmosphere becomes dry, whatever may be the range of temperature, the pestilential miasm loses much of its power, and the population, or those exposed to it, much of their susceptibility. It is therefore chiefly owing to the combination of heat with humidity that the former is influential in the diffusion of this pestilence.

126. *c*. The *Winds* have no mean influence in the development and spread of plague, especially in the East. At Constantinople, the north wind, called the Tramontana, which is dry and cool, prevents or arrests the progress of the distemper, whilst the Sirocco, or south wind, which is both warm and moist, favours the development and spread of the malady. High winds, especially when they are dry, remarkably diminish the infectious disposition, and restrain and arrest the propagation of the disease, chiefly by dissipating and diluting the miasms proceeding from the infected, and giving rise to freer ventilation in

crowded streets and houses. The salutary effects generally derived from placing infected troops or communities in tents, upon a dry, arid, or healthy soil, proceed chiefly from the readiness with which the winds pass under the tents and dissipate morbid emanations, or dilute them so as to render them inoperative. Dry winds also render the human constitution less susceptible of contagion. Thus it has repeatedly been observed that the Harmattan, a remarkably dry north-east wind, occasionally blowing for several days on the west coast of Africa, suspends the infection of small-pox, and that even inoculation of that disease is generally inoperative whilst it blows.

127. *d.* The *electrical conditions* of the atmosphere have been supposed to be more or less influential in producing epidemics of plague and of the other two pestilences; but the particular electrical conditions have not been shown, the negative state being most frequently accused. Very probably electricity, as it circulates through the animal œconomy and other objects on the earth's surface and passes off into the atmosphere, by its varying states and its influence upon the nervous system impairs in some cases, and increases in others, the nervous power and vital resistance of the frame, thereby rendering them more or less disposed to the invasion of infectious agents, and, as observed in respect of its influence on dead animal matter, imparting more or less of a septic tendency to the fluids and soft solids. Still the actual amount of influence of this agent on the living body is unascertained, and probably much exaggerated by many, especially by those who impute epidemics to atmospheric conditions, without admitting the efficient agency of specific infection.

128. *e. Local or endemic conditions* have been much insisted upon by some writers, and by several of those who have communicated with the French Academy on the subject of plague — these conditions, especially the accumulation of animal exuviæ, the decomposition of dead animals, incomplete modes of human sepulture, and burying the dead in vaults and crowded churchyards situated within or nearly contiguous to towns and cities; imperfect drainage and the passage of decomposing animal fluids and excretions, into cess-pools, into a low, wet and rich soil, or into canals, open drains, &c.; collections of animal and vegetable matters left to decompose in the air surrounding low, damp, and ill-ventilated dwellings, or in narrow and crowded streets; living in cellars or in close apartments on the ground, and having merely the soil impregnated with animal secretions and the fluids from animal decomposition, for a floor; adjoining marshes, estuaries, low grounds subject to inundations, ruinous and obstructed canals, stagnant waters, &c.; a deep, rich, and humid soil, accumulated for ages from the decay of animal and vegetable matter, and from the mud and slime produced by repeated inundations and evaporation by a warm sun; scarcity and unwholesome food; and the use of water contaminated by animal matter, by the decomposition of organised bodies, or by the infusoria, severally exert no mean influence in the development and spread of plague and other pestilences. It is seldom, however, that one or two merely of these conditions are found existing in a locality or town in the East, without being associated with others, or even with nearly all those now enumerated; and if they be singly injurious, as they must be admitted to be, how much more so must they prove when associated, and the emanations from them are elicited by heat, and accumulated in a humid and stagnant atmosphere. It is to the combination of a number of these, aided by moderate warmth and humidity, that many recent writers impute, as I have shown above (§ 106. *et seq.*), the generation of this pestilence *de novo*, and its endemic and sporadic existence; whilst others have maintained, in opposition to this view, that, so far from these circumstances having generated the plague, or given rise to sporadic cases, or to an endemic form of the pestilence, they have actually been unfavourable to the prevalence of it, when it has been epidemic, and that quarters of cities where they have been most remarkable have suffered the least from it on these epidemic occasions. It has been stated, even by the supporters of the origination of this distemper in these causes, that the Jews' quarters, and others the most filthy, and combining most of the conditions just specified, have suffered the least in various epidemics which ravaged Cairo, Smyrna, and other towns in the East; and an argument against the accuracy of their own views, as to the origin of the pestilence, has thus been furnished by themselves.

129. There can be no doubt of the injurious influence of these causes, acting either singly or in combination, upon human health; and of the fact of putro-adynamic fevers, typhus, adynamic dysentery, and other maladies, having originated in a combination of two or more of these circumstances, more especially when aided by warmth, humidity, crowding, and imperfect ventilation; but that they generate *de novo* this pestilence, may be disputed, as shown above (41.), or even that they constitute the sole source or centre of epidemic influence, during fatal prevalences of this distemper. Indeed, the precise part which these circumstances perform — the amount of influence which they severally or conjointly exert, in the generation, or in the diffusion of this pestilence, has not been clearly ascertained. Their noxious influence has been more a matter of inference than of demonstration; and numerous facts seem to show that other circumstances often associated with these, although not necessarily connected with them, are more concerned than they in the spread of the distemper; that crowding and the close and frequent communications with infected persons, and pestilential emanations from the clothes and bedding of the affected, and from their persons, and the concentration of these in a stagnant and humid atmosphere, are the principal and efficient agents of general infection; and that the several local or endemic states above enumerated (§ 128.) are operative chiefly in as far as they concentrate or accumulate these emanations, and prevent their dilution or dissipation in the surrounding air.

130. *f. Modes of sepulture*, have not received due attention, especially with reference to the generation and diffusion of pestilential diseases. In many places in Africa, especially among the Pagan and Negro tribes, and even among the Copts, the dead is generally buried in the houses or huts of the living; and as many of the dwellings have no other floors than the earth itself, i

must follow that, in the more populous and older towns, a most fruitful source of disease exists in the very dwellings of every family. This practice may be concerned in the origination or propagation of the hamagastric and septic pestilences, especially the former; but how far it is actually so concerned, cannot easily be determined. That it is injurious to health, cannot be disputed. I believe that it is more influential in the generation and spread of pestilence than the other local causes above specified (§ 128.), especially in humid and stagnant conditions of the atmosphere, and when aided by several of these causes. It was observed during the French revolution, that the trenchings, &c., made in many burying-grounds in order to obtain nitre, occasioned malignant fevers. And M. BORRINI, secretary to the sanatory establishment at Alexandria, states, that a cemetery near the city, in which more than 500 bodies were interred, during the plague of 1834 and 35, was opened in 1837 for the foundation of an edifice, and the plague appeared in the following spring. But it is difficult to determine in this instance how far this circumstance was concerned in originating or in propagating the distemper of the following spring. Although facts have been adduced, having some reference to this matter, they have been superficially observed and loosely described. That these occurrences are productive of malignant fevers and adynamic dysentery, cannot be doubted. I have met with instances of adynamic and putro-adynamic or malignant fever, which have proved fatal as early as the sixth day, caused by the foul air emitted from burying-grounds and vaults in this city, and that foul air from similar sources in warm climates, and even in colder countries in warm seasons, and in a more concentrated form, should occasion plague, is not improbable, although not so fully demonstrated. The evidence as to the origin, *de novo*, of the specific form of pestilence now under consideration from this source, is too deficient to admit of my connecting them as cause and effect. The subject requires further investigation before either the affirmative or the negative can be admitted. There is one circumstance which may be mentioned, that, although in the great plague of London about 100,000 dead bodies were put in the ground very near densely inhabited places in London, and although they were thrown into pits, each containing many thousands, and were covered only by a shallow layer of earth, still this pestilence was not continued during the years immediately following; but a malignant typhoid, or putro-adynamic fever, caused by the effluvium proceeding from the burying-places, and an adynamic or putrid dysentery, occasioned by the water contaminated by these sources, were remarkably prevalent in London during several years immediately consequent upon the plague. Similar occurrences are recorded to have followed very fatal epidemics of plague in other cities; but their causes have rarely been recognised or even inquired into.

131. It is indeed a matter of surprise that a chief source of the most malignant diseases—a source rendered manifest to the senses in the most disagreeable manner, and so easily connected with its effects—should be allowed so long to exist in civilised countries, and more especially in this, without the least interference; but this is only one of numerous instances of the disregard of health and life by governments in which particular classes obtain the power of legislating for their own interests, and in favour of property, with a total disregard of the public health, and of the protection of human life. The loaf of bread exposed to the tempted gaze of the starving is protected from his grasp, and the miserable wretch who cannot withstand the temptation placed in his way is made the subject of the severest punishment, contrary to the Mosaic law, so conveniently adopted in other matters; whilst the interests involved in the traffic of burial vaults and grounds in the midst of crowded localities prosper by the increasing amount of mortality they produce; and whilst the proprietors are fed and made rich by the very deaths they occasion, their interests are respected by the law and by the legislature, and the murderous traffic is allowed to proceed. But this is not the only way in which the public health and human life are made the wholesale objects of commercial speculation and private gain, protected by the glorious stringency of the laws in behalf of property. The vendor of poisons, whether with the intention of destroying, or with the avowed object of restoring health, is allowed to pursue his murderous vocation not only without hindrance, but is actually more efficiently protected in the exercise of it than the educated and scientific physician, who has devoted his whole energies to the honest and salutary performance of what he professes. Both kinds of depredators on human life have obtained, by the favours of the laws and of the expositors of these laws, by the forbearance of the legislature, by the ignorance of the aristocracy, by the devotions paid to wealth to the neglect of worth, and by the state of society generally in this country, vested rights in their vocations; and, at the present day, they are encouraged by church and state, and even applauded by numbers in the community, during the unblushing exercise of their hideous iniquities—

> "Murders most foul, as in the best they are;
> But these most foul, strange, and unnatural."

132. *g.* There are few causes more accessory to the prevalence of plague than *scarcity, and unwholesome articles of food.* Insufficient and unhealthy nutriment increases the septic tendency so remarkable in this pestilence, and favours glandular enlargements. The use of tainted animal food, of half-putrid meats and fish, of unripe or injured grain, and of numerous other unwholesome articles, often partaken of during periods of scarcity or want, although not originating the pestilence, certainly increases the susceptibility to, and the spread of infection. Hence the remarkable prevalence of the distemper on several occasions when the infection has been introduced into a place subject to scarcity or famine. Fatigue, all exhausting causes, especially sexual indulgence, mental depression, dread of infection, and want of sleep dispose the system to an attack.

133. *h.* There is much difficulty in determining the *influence of sex, age, and occupation* in favouring the infection of this pestilence. Much depends upon the exposure to which each is liable during an epidemic; and this will necessarily vary in different countries and epidemics. There is no doubt of medical men and hospital

attendants, and next to them the ministers of religion, having been more frequently attacked than any other class; a circumstance altogether arising from their greater exposure to infection. All those who were employed in burying the dead, in removing and attending upon the sick, or whose avocations brought them in contact with the affected, or with their clothes, or even near to them, have rarely escaped in any epidemic of which particular accounts have been furnished unless they were protected by previous attacks of the pestilence. It is said, that the water-carriers and the oil pressers and preparers in Cairo and other Mahommedan cities generally have escaped, and that the immunity of these classes was very evident in the epidemic of 1835. Tanners, curriers, and skin dressers have been found more exempt from plague than other artisans, as shown in numerous epidemics in both Europe and the East.

134. i. The plague, like small-pox, spreads more *rapidly, generally, and fatally among the negro and other dark-skinned races* than among the Caucasian race. In this respect it is opposed to the hæmagastric pestilence, which attacks more especially the latter. It was observed in the Egyptian epidemic of 1835, that the negro inhabitants were attacked and died in much larger proportion than others. The natives of countries also approaching the tropics, and even of those of the south of Europe, have been considered more liable to the plague than those of the north; and persons having weak and susceptible nervous systems, and feeble or disordered digestive organs, also have been said to be more predisposed than others; whilst those who are labouring under diseases attended by purulent or other discharges, generally escape. LARREY remarked, that the soldiers who had been wounded, or had sores or ulcers, were not attacked so long as their wounds or sores yielded a puriform discharge, but that they were not unfrequently seized as soon as the discharge ceased. During periods of the plague in Europe, numbers of persons have had recourse to artificial purulent discharges as a prophylactic measure, and frequently with success.

135. iv. *The hypothesis of insect life as a cause of disease* has been applied to plague and other pestilences. Dr. HOLLAND has discussed this hypothesis, in connection with the choleric pestilence, with great ability and eloquence (*Medical Notes and Reflections*, &c., 8vo. Lond. 1839, p. 560.), and adduced every consideration that can be entertained in its favour. Much of what may be said regarding the origin of that pestilence in this cause is equally applicable to the plague. Admitting that swarms of insects sufficient to cloud or to obscure the atmosphere may exist in it, and yet be so minute individually as to elude the unassisted vision; that the numerous infusoria &c. detected in fluids by powerful instruments is a strong argument from analogy in favour of this opinion; that these swarms of insects may be generated from the decomposition of dead animal matter, and that the circumstances which favour such decomposition may also favour other modes of existence too minute to be detected by our grosser senses; and admitting, moreover, that these insect swarms may be inhaled into the lungs, or be absorbed, they or their ova, from these and other surfaces, and occasion the most noxious and fatal effects, and that they may so travel as to explain certain courses taken by this and the choleric pestilence, still there are many facts and considerations which weigh strongly against this hypothesis. Indeed, all that has been adduced against the opinion of the atmospheric origin of these pestilences apply equally to this doctrine. If swarms of insects passing through, or floating in, the air, too minute to be perceived, and hence capable of passing into the circulating vessels, and there producing fatal distempers, were actually capable of occasioning what has been imputed to them in respect of either of the pestilences in question, we should expect a more or less simultaneous affection of the population of the district through which they passed; and seclusion or separation could not be viewed as being more likely to protect from this cause than from the atmospheric constitution contended for by others. It would be difficult, also, to connect what can be believed possible of such insect swarms with the several epidemic manifestations, and sporadic or endemic appearances of this and the other pestilences.

136. But these insect swarms have not been proved to exist in connection with individual cases or with the epidemic prevalence of plague or other pestilence. Those manifest and palpable swarms which have been occasionally observed in most countries, to such an extent as to darken the air, and to colour the objects on which they rested, and which furnish the chief argument for the existence of those supposed to be productive of plague or other pestilence, have not been found destructive of human life, although productive of more or less disorder. The transmission also of these distempers from one place to another, the transport of plague from the east to places in the west or north of Europe, and the various circumstances connected with the transport or appearance of pestilence in various distant, or even adjoining places, are not consistent with insect swarms existing in the atmosphere.

137. It is more probable that the material emanating from the infected, whether denominated the pestilential miasm, emanation, or effluvium, and infecting the susceptible among the healthy, either by direct or mediate contact, or by the respiration of the air more immediately surrounding the sick, actually consists of innumerable, impalpable, and invisible but living and organised existences, generated during the distemper, and thrown off as the distemper proceeds, in so minute but specific forms as not to be visible to the eye, although often admitting of recognition by the sense of smell. It is no very extravagant notion to conceive, what has the support of numerous circumstances and analogies, that during the more or less rapid effluxion of the vitality endowing the frame in this and other pestilences, the effluent vitality may associate itself with certain materials or molecules furnished by the diseased body, and thus may assume the state of organised existences, of specific form, but invisible and impalpable size, capable of infecting the healthy, and, by means of the malady they produce, giving rise to similar specific existances, thereby propagating, spreading, and perpetuating their kind. These innumerable and invisible existences, or organised swarms, whether than equivocally generated by changes in the states of

vitality and organisation in the highest of animals, or capable of perpetuating themselves by ova, may be supposed to assume certain determinate forms in each specific pestilence, the specific characters of which may depend upon the determinate forms thus assumed, and upon the manner these forms invade and affect the organs of our frames. It might be futile to add more in favour of infection by means of organised existences or parasites generated by the diseased, although much more might be added in support of the doctrine; but we well know that in proportion as the vital energies of the frame languish or are impaired, so are the parasitical animals peculiar to each of the higher animals more numerous, swarming, and fully developed; and it is not unreasonable to infer, that as vitality apparently changes its form, its conditions, and material alliances in these cases, probably without even the intervention of ova, and merely from the effluence of the vitality of the parent, and the combination of that effluent portion of vitality which molecules of matter which it fashions into certain specific forms, and which, moreover, although thus equivocally generated, it may even endow with the power and with the organs of reproduction. Rejecting, therefore, on the one hand, the doctrine of insect swarms floating in the air and producing pestilence, as being deficient in the evidences of their existence, and of their operation on the œconomy consistently with the phenomena presented by pestilence, and believing, on the other hand, that the opinion as to the material or emanation infecting the healthy is a living and organised material, consisting of innumerable and invisible forms or existences given off from the diseased body, has sufficient analogies and other evidences in its favour, I would recommend the future investigation of this subject by means of those aids which are now so much employed in physiological and pathological researches.

138. v. *There are certain conclusions respecting the causes and propagation of Plague* at which I am disposed to arrive, after the best consideration I could devote to these matters. I believe that they are consistent with the best evidence I can obtain, and with the actual state of our knowledge. If any of them be found inaccurate, the disposition to correct them shall not be wanting.

139. *a.* The amount of evidence (as I do most firmly believe the proofs of the last century equally valid with those of the present) favours a belief in the communication of the plague by contact of infected persons or clothes. Although the contact of these will very frequently fail of producing this effect, and although the evidence on some occasions may appear equivocal, and admit of other special explanations, still the frequent infection after the contact of these, the sequence of occurrences, and the connection of sensations, conspire to the formation of a well-founded belief that the result is produced in the way usually accredited.

140. *b.* From what I have stated above, I infer that the inoculation of the plague may be effected. That whilst its accomplishment proves the contagious nature of the pestilence, its failure, for the reasons I have given (§ 96.), cannot be justly considered as disproving the contagious property; and that, although the evidence of the communicability of plague by inoculation is not quite complete, it is sufficiently so, viewing it in connection with other modes of propagation, to warrant the belief that the plague may be communicated in this way also.

141. *c.* That in addition to, and even more frequently than, the infection by contact of persons and clothes, infection is produced by the emanations or effluvia given off from the sick, and inhaled by the susceptible upon near approach, remaining near or long with the infected, especially in humid and still conditions of the air, and in ill-ventilated apartments.

142. *d.* That the pestilential emanation, or effluvium, is absorbed and retained by bedding, bed, and body clothes, more especially when these consist of animal products; and that, if these articles are shut up immediately, or soon after they have been used by the sick, and excluded from the atmosphere, they may retain this effluvium, and by giving it off upon exposure to the air, they contaminate the surrounding air, and infect the susceptible who may respire the air thus contaminated.

143. *e.* That numerous occasions may occur in which it cannot be determined, in which way, or through what channel, the infection is conveyed, although no rational doubt as to the actual communication of the distemper from one person to another can be entertained, and that in many cases where the distemper appears to be communicated by contact, the proximity necessary to this act brings the susceptible person within the sphere of infection produced by a pestilential effluvium, or emanation from persons or clothes. Hence the experiment made in 1835, in the Hospital Esbekì, at Cairo, on two criminals, who, after having put on the body clothes of two persons who had recently died of the plague, lay down on their beds, prove infection either by contact, or by the air contaminated by the clothes, which were used and respired by the subjects of the experiments, or by both modes. In these two instances, infection was manifested on the fourth and sixth days.

144. *f.* That the period during which either the bodies of the dead, or the contaminated clothes may retain the power of infecting the living, has not been ascertained, and most probably no particular period can be assigned, as it may rationally be supposed to vary with the physical and other circumstances by which either source of infection is surrounded. There can, however, be no doubt that the dead body retains the power of infection during a period of considerable duration, and that the same may be said of the clothes and bedding of the infected, when these have been excluded from the influence of air and light.

145. *g.* That however we may speculate as to the nature of the specific miasm, effluvium, or emanation propagating plague or either of the other pestilences, we only know actually that it is specific, or of a determinate kind, in each distemper; and that it is so, is an inference, the truth of which is demonstrated by its effects, and especially by the fact of its propagating and perpetuating its kind. The effects, as well as other considerations, suggest the belief of a certain grade of vitality and organisation in the material given off by the diseased, and affecting the susceptible among the healthy, and consequently of a specific conformation or constitution of the in-

fecting material in each distemper, and they favour, but by no means prove, the idea of infection by the generation of invisible living existences by the diseased, that, either directly or by contact, or mediately, or by the air contaminated by these existences floating in it, affect the healthy in a similar and determinate manner.

146. *h.* That the chief and most frequent channels of infection are the respiratory passages and organs: the air inhaled conveying with it the contaminating or infecting agent, whatever this may be, and thereby infecting the healthy, whenever this agent is sufficient in quantity or concentration relatively to the susceptibility of the person exposed; but that infection may take place in some instances and circumstances from the cutaneous and digestive mucous surfaces, although much more rarely, and merely contingently.

147. *i.* That we have no valid evidence, in respect of plague, more than as regards the other pestilences and the exanthemata, that this distemper may be generated *de novo* by certain sources, namely, by the emanations from dead animal matter, or from the exuviæ and dead bodies of our own species, although numerous circumstances favour this doctrine, whilst others militate against it, and support the opinion, that the pestilence is perpetuated by contagion and infection, during circumstances favourable to the communication of it; and that it is prevented from being extinguished by the transport of it from one place to another, its existence and prevalence in one or more places, when it has disappeared from others, furnishing the means of its return to those places from which it had entirely disappeared for a time.

148. *k.* That many of the circumstances which suggest the doctrine of spontaneity, or the generation *de novo* of the plague, on occasions of its appearance and prevalence in places where these circumstances exist in the most evident manner, remarkably favour the propagation and perpetuation of the pestilence, and, in fact, constitute the condition which has been denominated epidemic constitution influence, source, centre or *foyer*; but they require the presence of the pestilential germ or infection, whether already existing sporadically or endemically, as incorrectly termed, or being latent in certain fomites, or imported from more or less distant places, before the malady can be developed and disseminated.

149. *l.* The period of *incubation*, or the time elapsing from the moment of exposure to the infecting agent to that at which the effects become manifest, has been variously estimated. It evidently varies in duration with the concentration or amount of the dose of infection relatively to the susceptibility of the recipient. It may be so short as not to admit of recognition, as in the occasion of a cart conveying a number of bodies to the pit dug to receive them, when, upon the jolting of the cart, a most overpowering gush of foul air proceeded from the bodies which it contained, and almost instantly struck down a person who was near it, and who died in an hour or two afterwards; and the period may extend to ten or eleven days. The period has not been supposed to be longer than this by most of those who have communicated with the French Academy of Medicine on this subject.

150. *m.* That an attack of plague protects from a future seizure, as certainly, as an attack of small-pox, or of any other of the exanthemata, protects from a second infection. That this fact, fully proved by Dr. RUSSELL and others, has not been sufficiently recognised by several recent experimenters; although it is of great importance in selecting attendants on the diseased, and in our speculations as to the propagation, prevalence, and sporadic or endemic existence, of the pestilence, and as to the escape or insusceptibility of many of those exposed to it.

151. *n.* That the occurrence of infection from merchandise or goods, of any other description than clothes and bedding used by the sick, must be very rare, as the circumstances in which these can be infected by plague must necessarily be rare; and even when clothes and bedding are contaminated, exposure for no very long period to due ventilation, especially when the air is dry and the wind is high, will be sufficient to deprive them of any infectious property.

152. *o.* That the various predisposing and accessory or determining causes of plague have not been fully ascertained, and their influence determined further than may be inferred from what I have stated above (§ 124. 127. *et seq.*); and extremes of temperature, dry states of the air, and free perflation and ventilation always either arrest or restrain the spread of this pestilence.

153. VI. MORTALITY FROM PLAGUE. — This pestilence is probably the most fatal of any to which the human frame is liable. At Marseilles, it was believed that above one half of those seized died of it; and in certain places and institutions, the proportion of fatal cases was even higher. Thus, in the "Hôpital de la Charité," 1013 cases were received, and 585 died. In the "Hôpital du Jeu de Meril," 1512 persons were received, and 820 died: and in the lowest classes, the proportion of deaths was still greater. As respects the plague of London in 1665, and all the more recent outbreaks of the distemper in other cities and districts, there is no evidence that the mortality has been much less, but we have no statistical information upon which any reliance can be placed. It is very generally remarked that, at the beginning of an epidemic, although the malady is least diffused, it is the most fatal; that during the increase and height of the pestilence, a larger proportion recover; and that, during the decline, the numbers attacked are much diminished, and the comparative mortality is much less. These facts may be explained on the supposition, that in the early progress of the distemper, the most predisposed to infection are first attacked, and being the most susceptible, are the most liable to sink under it; that, as the sources of infection multiply, the less susceptible are also attacked, but are the least severely affected, and recover in greater numbers; and that, after a certain number of weeks or months, when the distemper has been introduced among a dense population in a town or city, the least susceptible only remain to be infected; and, if these are attacked, they are the most likely to recover, unless they are exposed to a more concentrated infectious effluvium, or have become more predisposed to a severe infection. Hence it often occurs, as noticed by Dr. RUSSELL and others, that some persons who have been in close communication with the sick, have resisted

infection until the decline of the epidemic, when they have been attacked, and even died.

154. The prevalence and mortality of plague depend much upon the numbers of those, in a district where it has been introduced, predisposed to infection. If the distemper has been frequently epidemic there, or has been lately remarkably prevalent, a considerable number of persons protected from a second attack will necessarily exist. The most susceptible of plague, as in the hæmagastric pestilence, has been said to be the young, robust, and plethoric; but this is not fully established, especially as regards the rate of mortality among them, which has also been considered as high. The greater prevalence of the distemper among these persons is probably owing to the greater exposure to infection to which they are liable. The fact of the mortality being the greatest among the negro and dark-skinned races, whose frames are much less powerful than the Caucasian, would indicate a comparatively less mortality among those which are young and strong. The recent observations of the European physicians who have practised in the East, do not appear to confirm the opinions as to the greater liability of, and greater mortality among, robust and young persons; indeed, there is every reason to believe, that however susceptible such persons may be of infection, at least the proportion of recoveries is greatest among them.

155. There is no datum from which any inference can be drawn as to the influence of different modes of treatment upon the mortality of the distemper, more especially during the epidemic prevalence of it among a dense population. The varying characters, severity, and complications of the disease, must render any particular method of cure altogether unsuitable to some cases, although most appropriate to others; and thus all exclusive plans or measures must be equally successful, or rather abortive, if universally employed. It is in this distemper, as indeed in all others, most manifest, that the careful adaptation of the means of cure, and the varying and suitable combination of them to existing grades, states, and associations of morbid action, can alone have the effect of so controlling or arresting such action, as to influence the comparative rate of mortality.

156. VII. THE NATURE OF PLAGUE.—My views of the nature of this pestilence may be inferred from what has been advanced above, respecting the *occasions* and *causes* of its outbreaks, and the phenomena presented by the infected. My remarks, therefore, on this topic, are merely a summary of what appears to be, as well as not be, fully established respecting it.

157. *a*. Plague is a contagious and infectious distemper, according to the meaning attached to these words, both above (§§ 58, 59.), and in the article INFECTION, and in the favourable circumstances and states of susceptibility already fully insisted upon (§§ 124. *et seq.*); and a person who has been once attacked by it is protected from a second attack, as proved by RUSSELL, WHITE, and others.

158. *b*. The infection of plague may be preserved in, and propagated by the bedding, bed, and body-clothes of those who have been attacked; and the pestilence has been propagated by these means, in the circumstances and states of susceptibility above shown (§§ 124. *et seq.*), as well as by personal communication or contact.

159. *c*. Goods, or articles of trade or merchandise, not having been used by the sick, cannot be expected to propagate the distemper in any circumstances, especially if they have been exposed to the air.

160. *d*. The infectious emanation or poison, when received into the lungs during respiration, may so depress the organic nervous energy and vital power of the frame, and so contaminate the circulating fluids, as instantly to produce manifest effects, or even to destroy life in two or three hours, when this emanation is very powerful or concentrated, relatively to the state of vital resistance. When, however, this poison is less powerful, or the infection of the frame differently produced, and when the vital resistance to its morbid impression and contaminating influence is energetic, then a more considerable period is required to develop its operation and noxious effects in a manifest and specific form; but the extreme duration of that period is not precisely ascertained, although it is generally believed not to extend to above eleven or twelve days.

161. *e*. The changes produced upon the healthy by the infecting miasm evolved from the sick, are of an asthenic and septic character; and however high the vascular reaction may be, owing to the powers of the constitution—to the vital resistance opposing the poison invading and contaminating the body—there is a tendency to a dissolution of the crasis of the blood, and of the vital cohesion of the soft solids: the capillaries, the lymphatic glands, and the cellular and mucous tissues, early experiencing and manifesting the effects of these changes.

162. *f*. As the phenomena and characteristics of this distemper have been uniform during ages, and in all countries, however far apart, and wherever they have been observed, so it may be presumed, that the efficient cause is also uniform and specific, reproducing its kind on all occasions, and with the power of perpetuation *ad finitum*. The distemper being specifically the same in all ages, the cause may be also considered to be of a specific kind, and to be preserved and propagated by the successive infections produced by it, as shown above (§§ 103, 104.); and although numerous circumstances favour a belief in the generation of this infection *de novo*, or in its spontaneity, still the evidence is not conclusive on this point, and still more numerous circumstances and considerations oppose it (§§ 108. *et seq.*).

163. *g*. The characteristic changes of this malady are accompanied by various accidental or adventitious phenomena, arising out of the concentration of the exciting cause or morbid poison occasioning it, of the state of susceptibility of the recipient, and of peculiarity of temperament, constitution, and habit of body; and probably, also, out of the conditions of the digestive, assimilating, and excreting viscera at the time of infection. Hence sometimes appear, in the course of the malady, certain prominent affections, or complications, which may more or less characterise it, in addition to those which are specific and are constant. Owing to this circumstance, J. FRANK and others have divided the distemper into certain *states* or *forms*, namely, the *Simple*, the *Inflammatory*, the *Gastric*, and the *Nervous*, according to the predominance of the affections corresponding with these designations. But this division is

defective, inasmuch as the most severe and most rapidly fatal cases of the distemper are not comprised in any of the above states, the patient sinking rapidly, owing to extreme and rapidly increasing depression or annihilation of the powers of life, without vascular reaction, or prominent affection of the gastric or cerebro-spinal organs.

164. *h.* It is probable, that the circumstances of locality may also modify the type or character of the febrile phenomena of plague,—that on occasions of the extension of infection to places productive of emanations from marshes, &c., and at seasons when the malaria from these sources are most abundant, the infection of plague may be attended by either an intermittent or a remittent type of fever. It has been contended, when plague has appeared in such localities, and has presented more or less of a periodic fever, that the distemper has actually originated in the increased concentration or intensity of the malaria generated in these places. But there is no proof of this actually having been the case; but every reason to believe that the distemper had been introduced, and that the existing malaria had imparted to it more or less of a periodic character.

165. *i.* Although it is admitted, that the foul air generated by the decomposition of animal substances, and of animal exuviæ, will produce continued fevers of a malignant or putro-adynamic character, especially when decomposition takes place in a warm, humid, and stagnant air; and, although it is probable that plague may be thus generated *de novo*, still the evidence of this actually being the case is not conclusive; and we are, therefore, led to infer that, as the distemper is specific or *sui generis*, so is the infectious agent or poison which perpetuates it, however it may have originated (§§ 103, 104.).

166. *k.* Although the plague presents most of the characters of a malignant or putrid fever in the highest degree, it cannot therefore be inferred to be identical with that fever, as some writers have contended, inasmuch as it possesses certain specific signs and lesions which are not present in the latter, and which do not appear in those cases of malignant or putrid, or putro-adynamic fever, which arise from infection.

167. VIII. TREATMENT OF PLAGUE.—The treatment of this pestilence may be said to have been hitherto altogether empirical. The great number of medical men who have, since the commencement of this century, visited the East and practised for many years in countries where the plague is most prevalent, have thrown no light upon the cure of it. The introduction of Quinine and of the Chlorides into practice, during this period, has added somewhat to the means of cure available for the distemper; but the former is merely a preparation of a substance previously in general and even beneficial use in most cases of this pestilence, and the latter has not always been employed in such modes and combinations as are calculated to show the full amount of their virtues. Even popular remedies, such as olive oil, have not received that attention from European physicians which their reputation amongst the Arabian doctors might have excited. Indeed, the perusal of accounts of the numerous means resorted to against this distemper, from the beginning of the sixteenth century down to the present day, leaves the humiliating and lasting impression on the mind, of the very inefficient and contemptible nature of most of them, when we compare what is known of the operation of these means upon the economy, with the obvious nature and remarkable severity of the changes characterising the distemper. It must be most manifest to all who endeavour to combat the changes and morbid conditions constituting a malignant disease, and who attempt to employ agents appropriately to pathological states inferred to exist, that those agents should neither be doubtful as to their operation, nor be of a trifling kind as to their effects—that they should possess energetic and determinate properties, and be employed so as to produce a decided operation; and that the activity and the combinations of the means should be directed with strict reference to the remarkable depression of vital power throughout the frame, and to the poisoned condition of both fluids and soft solids characterising this malady. But have the means employed against this pestilence possessed these attributes, or been prescribed with due reference to morbid conditions, or in those modes and combinations which could rationally admit of any hopes of a beneficial result from their exhibition? I can safely answer, that, in 99 cases out of 100, where the means resorted to have been described in connection with the states of the case for which they were prescribed, that no such hopes could be rationally entertained, and that, if any advantage actually did accrue, it was due to the efforts of nature,—to the innate vital resistance to morbid changes, and not to the agents employed. Of the treatment of plague, the most important part is that which relates to *the protection of the community from its introduction*, and *of individuals from its infection, after it has been introduced*. This will, however, be discussed in the sequel, when considering the means of protection applicable to this and the other pestilences (see PESTILENCES, GENERAL AND INDIVIDUAL MEANS OF PROTECTION FROM); and I now proceed to discuss *the curative treatment of this distemper*.

168. i. CURATIVE TREATMENT OF PLAGUE.—I have sufficiently insisted, in the foregoing pages, on the necessity of removing all affected by malignant diseases, into a pure air, and into a large well-ventilated apartment, whenever this can be accomplished; and it is the more especially required for cases of this pestilence, and more particularly for those attacked in close, crowded, and low situations. But this removal should be effected with a due regard to the protection of the healthy, and to the limitation of the pestilence. Persons who have already had the disease should be employed about the sick in preference to others, and personal cleanliness should be strictly enforced. There is nothing which tends more, as regards not only this, but also the other pestilences, to increase the infectious property, than the use of soft beds, especially those stuffed with wool or feathers, of woollen bed-clothes, and the neglecting frequently to change the night and inner body-clothes. There is every reason to believe, that the entire disuse of bedding and coverings, consisting chiefly of woollen or other animal materials, in countries liable to outbreaks of pestilential distempers, would tend much to prevent the diffusion of infection.

169. *A.* At the commencement of an attack, *emetics* have been much recommended both by the older and more recent writers. M. AUBERT

states, that, in the more benign cases, they were always followed by an abatement of the symptoms, and generally by recovery, which would take place without further treatment, but then convalescence was prolonged; that he never observed any unpleasant effects from them in any circumstances; and that, in the more dangerous cases, the progress of the distemper was often arrested for a time by them, thereby giving time to act, and the patient was not weakened by them, as by bleeding. He therefore regards emetics as most beneficial early in the disease, in all cases. M. AUBERT, however, offers no remarks as to the emetics which should be preferred. But it is obvious, from the nature of the malady, that a preference ought to be given to those which are least likely to lower the powers of life, and that these should be conjoined with stimulants, or warm aromatics. Thus, *sulphate of zinc* may be prescribed with capsicum, camphor, ginger, cinnamon, &c., and *ipecacuanha* either with these, or with ammonia and aromatics. Dr. HODGES very justly remarks, that the dose of the emetic should be large enough to operate soon, and to evacuate the stomach completely; that it ought to be given only in the infancy of the distemper, and not when the stomach has been freely evacuated by the retchings which often accompany the more full development of the malady, and that antimonial preparations are not advisable.

170. *B. Blood-letting* has been considered injurious in the plague by the great majority of both old and modern writers. SYDENHAM, DOVER, and a few others have, however, advised large blood-letting; but the former possessed not the experience of his contemporary HODGES, who strongly opposes this practice; and the disease for which DOVER employed copious bleedings, was not the true plague. HODGES observes, with much justice, that "if the authority of the ancients, as well as the experience of the moderns, have any weight, and indeed if my own practice may be regarded, it is highly to be feared, from many instances, that bleeding in a genuine pestilence is not only to be suspected, but charged as pernicious." MM. AUBERT and RIGAUD had recourse to blood-letting in Europeans, for whom they believed it to be sometimes of use; but they considered it as generally injurious in the Arab constitution. M. DULONG states, that the violence of the fever, and the imminent congestion of some important organ, induced him to have early recourse to venesection, and sometimes even to repeat it. Generally an amendment immediately followed the operation, but it was of short duration, and he rarely obtained any signal advantage from the practice. He, however, found the application of *leeches* behind the ears when the head was prominently effected, or upon the epigastric region, when the digestive organs were remarkably disordered, to be of considerable service.

171. MASSARIA believed that blood-letting was beneficial in the plague of Vicenza in 1576; and he was considered by his cotemporaries as a great authority. Opinions, however, greatly preponderate against this practice; yet, in some cases, especially among the nations of northern and temperate climates, in young, robust, and plethoric persons, and in the sanguine temperament, a moderate vascular depletion, early in the distemper, may be of service, and may dispose the system to be more readily influenced by diaphoretic and restorative remedies. In cases such as these, SYDENHAM recommended venesection to a large amount, and even to be repeated; but, when he found the practice opposed by the patients and their friends, he confided chiefly in a moderate blood-letting, and followed it immediately by full and frequent doses of warm diaphoretics.

172. *C. Sudorifics* appear to have received the favourable testimony of almost all writers on this pestilence. DIEMERBROECK, VAN DER HOYDE, SYDENHAM, ORRÆUS, RUSSELL, CHENOT, PUGNET, DESGENNETTES, and many others, trusted chiefly in them, selecting those of a warm and stimulating kind.—*a.* Dr. HODGES remarks, that all authors and practical physicians agree in this, namely, to throw out the pestilential poison as soon as possible by warm sudorifics, or *Alexipharmics*, according to the nomenclature of the day. It would be of little advantage to notice the numerous and very diversified substances which he recommends for this purpose; but amongst these are to be found some of the most energetic substances, which are employed at the present day. He adds, "that recourse should be speedily had to these remedies as to a sacred refuge; and there is such plenty of them, that nature seems to have had more than an ordinary indulgence and forecast in providing them against this destructive enemy of mankind." Of these remedies, he considered the *Virginian Snake-root*, with much justice, "the most efficacious diaphoretic and Alexipharmic for expelling the pestilential poison." And the next place he believed to be due to the *Contrayerva-root*, which, as well as the snake-root, he combined with a number of other vegetables of a stimulating and aromatic nature, in every conceivable form — in powder, electuary, infusion, decoction, &c.

173. *b.* Of *Mineral sudorifics* there is none so safe and efficacious as the one first introduced into practice by MINDERER, and so long known by his name — the Spirit of Minderer, or *liquor ammoniæ acetatis;* and, when given with the *ammonia* very considerably in excess, it is more to be depended upon,— more febrifuge and diaphoretic, especially in all low, pestilential, and exanthematous fevers, than any other medicine with which I am acquainted. In all these maladies, and especially in plague, it may be conjoined with the *infusion of serpentaria*, or with the *decoction of bark*, or with *camphor*, or with all these, when the powers of life are much depressed, and unable to resist the poisonous tendency of the infection on the frame: but in such cases the ammonia should be also greatly in excess, unless the urine indicates an ammoniacal tendency, when the *aromatic acetic acid* may be substituted, and it be allowed to be in excess.

174. *c.* Many years ago, frictions of the surface with warm *olive oil* was much recommended by BALDWIN and others in the treatment of plague, with the view of promoting a copious sweat, which seldom failed of supervening. The practice was common in the East from the earliest times; and the oil was also taken internally with the belief of its possessing both prophylactic and curative properties. Several experienced writers are much in favour of it, and the evidence is very conclusive as to its diaphoretic operation when employed externally; but it is by no means so as its curative influence, yet even in this way it appears some-

times to have been of use. Mr. JACKSON, in his account of the very destructive plague which was introduced into Morocco in 1799, recommended it to many, both as a preventive and as a cure; and he states in both characters it was eminently successful.

175. *D. Purgatives* have been found generally injurious by most writers on this pestilence. BOCKEL states that they were remarkably so in the plague of Hamburgh in 1565; and PALMARIUS, DIEMERBROECK, and RUSSELL, as well as most recent authors, have been equally decided in the reprobation of them. It is evident, however, that the moderate evacuation of the morbid secretions and excretions is not so much dreaded by them, as the disposition existing in most cases of the distemper to diarrhœa, and the difficulty of limiting the operation of purgatives to a moderate evacuation, and of preventing inordinate and exhausting discharges from the exhibition of them. It must be obvious, that the evacuation of accumulated secretions and excretions from the bowels, and the prevention of any collection of these, are most important objects in the treatment; but they should be attempted by such mild agents as are most readily controlled, and the least liable to excite irritation, in the weakened and already irritable intestinal mucous surface. It is extremely probable, that *olive oil*, when used internally as well as externally, produces a mild demulcent, or soothing, as well as laxative effect on the bowels, without occasioning an operation of an exhausting kind, or one which is not readily restrained by the other remedies usually employed against the malady. Although much employed as a popular remedy, it has not received that attention from the regular members of the profession which I think that it deserves, from my knowledge of its effects in several other diseases. Judging by analogy, and guided by other considerations, I would advise the occasional combination of the *oleum terebinthinæ* with this oil, and the exhibition of it both by the mouth and in enemata, according to the circumstances of the case; guarding, at the same time, their action by means of *aromatics*, *spices*, and small doses of *opium*, or of camphor with opium.

176. *E. Stimulants, tonics, and antiseptics* have been generally employed against plague, and are more applicable to it than to any other malady. Indeed, I much doubt the propriety of withholding them in any state or stage of the distemper whatever, even where vascular excitement appears the most violent. The vascular reaction often occurring at an early period of the malady is of that open and expansive kind, which indicates greatly reduced vital power in connection with morbid action; and it will certainly be found that no more in this distemper, than in other malignant diseases similarly characterised, can this action be subdued without restoring, as far as may be, vital power, and enabling it to resist those changes by which this action is excited and perpetuated. In fact, the same principles, upon which I insisted when discussing the treatment of the *Hæmagastric Pestilence* (§§ 178. *et seq.*), should also be adopted in this. Even in cases of the most violent vascular action, and when it may be prudent to have recourse to a moderate or full bloodletting, the stimulating diaphoretics already noticed, with full or even large doses of the *sesquicarbonate of ammonia*, or of *camphor*, or of the *sulphate of quinine* and *camphor*, should be prescribed as frequently as the urgency of the case may require. Sir A. BROOKE FAULKNER states that in two instances, a large quantity of *spirits of turpentine* and of *camphor* were taken by mistake, and that both recovered.

177. *a.* The remarkable loss of tone throughout the vascular system, in this as well as in the preceding distemper, prevents the vessels from accommodating themselves to the quantity of blood in the system, and creates a demand upon the heart to support the circulation by means of greatly increased action; hence, in the great majority of such cases, even a moderate bloodletting is often detrimental, inasmuch as it still further increases the loss of that due correspondence which should exist between the state of the blood-vessels and the amount of blood circulating in them, unless, indeed, the depletion be immediately followed by the exhibition of stimulants or tonics; and of those the most to be depended upon are *camphor*, *quinine*, *ammonia*, with or without the *liquor ammoniæ acetatis*, the preparations of *serpentaria*, or of *arnica*, the *hydrochloric æther*, &c. Of all these, *camphor* and *ammonia* are the most generally of service; and the former is congruous with any other remedy which may be employed; but it should be prescribed in full, or in frequent doses. The *sulphate of quinine* has been very favourably mentioned by most recent writers; but it has only taken the place of the *cinchona bark*, which was formerly much used in this distemper, with serpentaria, ammonia, and other stimulants. It will be found, that the combination of the *quinine* with *camphor* and *capsicum*, and the exhibition of all three in full doses, will prove most decidedly beneficial, especially during the earlier stages of the malady.

178. *b.* When *irritability of stomach* prevents the due exhibition of stimulants or tonics, or the retention of them, an *epithem* of warm spirits of turpentine should be applied over the epigastrium; and this will generally allay the retchings, if it be properly applied; and remarkably aid in bringing out and promoting a most copious perspiration. In this state of the distemper, which J. FRANK denominates the *gastric form*, effervescing draughts are generally grateful. Dr. RUSSEL is in favour of the use of these, but those of the carbonate of ammonia, with either the citric or the acetic acid, the ammonia being considerably in excess, should be preferred; and such restoratives and antiseptics as the circumstances of the case may suggest be prescribed, from time to time, and chiefly in enemata when the stomach still continues irritable. About a drop of *creasote* may be given with each dose of the medicines; and several drops of this substance may be added to the enemata, especially when diarrhœa is present.

179. *c.* At an *advanced stage* of the distemper, or from the commencement of the attack in cases presenting much depression and other signs of malignancy, the more energetic stimulants and tonics recommended for similar states of the *Hæmagastric Pestilence* (§§ 179. *et seq.*) may be resorted to, as being quite appropriate to these cases. Indeed, whenever vital depression is very remarkable, the stimulants prescribed ought to be such in kind and quantity as will produce an immediate effect;

and the selection of them should be guided by the previous habits and circumstances of the patient. Several of the stimulants in more general use are also *antiseptics*, and these should be given in full and even large doses, especially those mentioned above (§§ 176. *et seq.*). But they ought not to be deferred until a too far advanced period of the disease; but should be prescribed early, especially in the more malignant or septic cases, and given in decided doses and in efficient combinations. It does not appear from the recent works on plague, that the *chlorides* have been employed in it in such a manner as fully to test their efficacy; and in such combinations as are most likely to prove beneficial. The most appropriate of these is probably the *chloride of lime*, conjoined with camphor, aromatics, and opiates. The *chlorate of potash* also promises to be of service, especially when prescribed in stimulating or tonic infusions or decoctions, particularly the infusion of *cusparia*, or of *serpentaria*, or of *cloves*, or of *valerian*, or the decoction of *cinchona*, or of *senega*, or *tormentilla*, and with various other restoratives and aromatics. The *hydrochlorate of ammonia* was formerly much employed in low fevers; it is equally suitable for this malady, and it may be taken with any of the substances just mentioned, in as large doses as the stomach will tolerate, or from ten to twenty grains. Its good effects will generally be promoted by the addition to each dose of from half a drachm to a drachm of the *hydrochloric æther*. Various formulæ for the medicines recommended at this place will be found in the APPENDIX, more especially *Form.* 385. 387, 388. 409. 416. 431. 437. 439. and 848., which may be prescribed in quantity and frequency of dose according to the severity of the disease.

180. M. AUBERT states that he gave *phosphorus* in many cases of this distemper; but it does not appear that any decided benefit was derived from it. The formula for it in the *Appendix* (428.) is a suitable mode of employing it in this disease. This physician mentions a new medicine, called *hachisch*, which he considers of great efficacy in this malady. He furnishes no information as to the nature of this substance, but states that several cases recovered by its aid, which he considered altogether hopeless before it was administered. He gave it in doses of one, two, or three drachms in coffee; and it appears to have had a stimulating and exhilarating effect.

181. *F.* At the commencement of the present century, the *affusion of cold water over the surface* was considered the most successful and most generally appropriate remedy in all fevers, especially those of a severe or malignant form. Experience has shown the very exaggerated estimate then formed of this practice. It was at that time recommended for plague as well as for other pestilential maladies; but observation and reflection have shown that, unless where the vascular reaction was high, and the heat of the surface was much increased, and at the early period of reaction, the practice was sometimes injurious, and often of doubtful advantage. I can find no evidence of its having proved of service in this distemper; although it is probable that it may, in those cases which are characterised by more violent vascular reaction, and which have, from this circumstance, been by some viewed as presenting an inflammatory character, advantageously precede the frictions of the surface with olive oil (§ 174.) that have generally been found so beneficial in bringing out a copious perspiration.

182. *G.* The very general recourse which was formerly had to *mercurials* in the cure of fevers by British physicians, more especially to *calomel*, was extended also to the plague; but the diarrhœa which is so apt to come on, in the course of the malady, restricted their use; and their effects, in any form, appear to have been equivocal. The trials, however, made of them by Mr. STAFFORD, as related by Sir B. FAULKNER, seem to indicate that they deserve a further and a more satisfactory trial. Calomel and mercurial inunction were the means employed, with the view of producing their specific effects. They have been also recommended by SCHREIBER, FORMAY, SCHRAUD, and others; but, as OLIVIER has observed, the system resists the specific effects of all mercurials in the severe cases, and the slight cases do not require a recourse to them. If calomel should be employed, it ought to be conjoined with opium and aromatics to prevent it from disordering the bowels; and even when thus combined, this effect may nevertheless ensue.

183. *H. Diarrhœa* is one of the worst symptoms which occur in the course of the distemper, and is generally controlled with great difficulty, especially when it appears at an advanced stage. At an early period, *opium*, conjoined with camphor, creasote, and aromatics, will frequently restrain it; but the more active *astringents*, conjoined with *antiseptics*, will often be required, more especially the *chloride of lime*, the *sulphate of zinc*, conjoined with *catechu* or *kino*, &c., and with opiates. These substances should also be administered in enemata.

184. *I.* The treatment which has been fully described as most beneficial in the hæmagastric pestilence is in most respects suitable to this, the several means of cure being varied according to the form which the malady assumes. Many of the distinctions, however, which have been pointed out by writers, will hardly be made out in practice; and, though they may be prominent in some cases, they will hardly appear in others. It will be sufficient for the physician to bear them in mind, to adapt his measures to the features of each case which may come before him, whether *inflammatory*, *nervous*, *gastric*, *putrid*, or *septic*, according to the views of various writers; to act upon pathological principles; and to employ his remedies conformably with their ascertained effects.

185. *K.* As to the *local treatment* of the *buboes* and *carbuncles*, little further is required than the application of poultices, fomentations, or emollients, as their states may require. When matter or other fluid accumulates, an exit should be given to it, in order to prevent the contamination of the adjoining tissues, and an healthy suppuration ought to be promoted. Subsequently the healing process may be encouraged by means of such digestive and gently stimulating applications as the case will suggest. The condition, however, of these sores will be much more efficaciously controlled by the internal or constitutional treatment than by local applications; and in most cases it will be necessary to support the powers of life, when the external lesions are considerable, in order that the process of restoration may go on satisfactorily.

186. *L.* The *diet* and *regimen* of the patient should be the same in this as in other fevers. Indeed, the diet and regimen which are suited to this pestilence are also suitable for the others, especially the *hæmagastric*. At an early period of the attack, especially when febrile reaction is considerable, and the disease assumes that form which has improperly been denominated the inflammatory, owing to the vital resistance and vascular disturbance, simple diluents and refrigerant and diaphoretic drinks are the most serviceable; but in a more advanced stage, or in more protracted cases, and where the vital powers are depressed, a more restorative diet may be allowed, as chicken, veal, or mutton broths, beef-tea, &c., which may be taken with sufficient salt and spices to render them palateable; and as the distemper advances, and vital depression increases, wine, brandy, or liqueurs may also be taken, diluted in various ways, or in arrowroot or sago. In this distemper, as well as in the hæmagastric, hock or sherry, with seltzer water, champagne, brandy in the warm infusion of black or green tea; the bitter Hungarian and Austrian wines; milk or green tea punch; the yolk of an egg beat up in brandy and water or sherry; various kinds of jelly, &c., may be severally given, according as the circumstances of the case will suggest to the physician a guarded recourse to them. There is every reason to believe that in this malady, as well as in other low fevers, the use of these and similar dietetic restoratives is often too long deferred; and that the cravings of the patient for them are very improperly unheeded. In the diet and regimen, as well as in the medical treatment, of patients in low or malignant fevers, the physician has been too often guided by prevailing theories and doctrines, instead of proceeding warily in the path of close observation and sound common sense. With these as his guides, whilst he endeavours to fulfil the intentions rationally inferred from recognised states of morbid action or of altered structure, the physician will generally act safely and efficiently; and will produce as successful results in this as in other distempers, as can possibly be produced by the limited amount of human means and of human intellect.

187. *M.* The *management of convalescence* should depend upon the circumstances in which the patient is placed, and be ordered accordingly. The chief points which require attention are the enjoyment of a pure air and due ventilation; suitable diet; and the due promotion of the several digestive and excreting functions. During this period, care should be taken that the extent of the external sores, or the amount of the discharges from them, should not exhaust the patient, or cause a too protracted recovery. The constitutional powers, in such circumstances, often require the aid of both medicinal and dietetical restoratives; and these should not be timidly withheld, or too profusely allowed. At this time a healthy atmosphere is remarkably beneficial; and as soon as the patient can bear removal to a different air, the change will prove the greatest restorative; but this must be done with due precautions and regard to the health of the uninfected.

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PESTILENCES, PROTECTION FROM. — Having considered the three destructive pestilences of modern times, in respect of their causes, propagation, nature, and treatment, as fully as my limits have permitted me, I now proceed to notice the measures which should be taken to protect the community from them, and the prophylactic means which may be used by individuals against them. In order that the subject may receive due attention, I shall discuss it according to the following *arrangement:* —

I. PROTECTION OF THE GENERAL COMMUNITY FROM PESTILENCE.

i. PREVENTION OR WARDING OFF PESTILENCE.

A. By sanatory measures having reference to the state of the locality, and to the community.— Prevention of domestic causes.

B. By measures intended to prevent the introduction of pestilence from abroad. — Prevention of foreign causes.

ii. The ARREST OF THE SPREAD OF PESTILENCE WHEN INTRODUCED OR PREVAILING.

A. When introduced or prevailing in towns, cities, &c.

B. When introduced among troops, armies, or garrisons.

C. When introduced into ships.

II. PROTECTION OF INDIVIDUALS, FAMILIES, OR CLASSES.

i. PROTECTION BY SECLUSION, OR STRICT QUARANTINE, &c.— DEPARTURE FROM THE SOURCES OF INFECTION.

A. Estimate of the means answering this protection. — The avoidance of infection.

B. Restrictions which should be imposed on those departing from an infected locality, and when they should be imposed.

ii. PROTECTION BY SUCH MEANS AS MAY ENABLE THE CONSTITUTION TO RESIST INFECTION.

A. Medicinal Prophylactics.

B. Dietetic, Regimenal, and Moral Prophylactics.

2. I. THE PROTECTION OF THE GENERAL COMMUNITY FROM PESTILENCE.— The objects of government, in all civilised countries, are, the protection of the lives and properties of the inhabitants; the observance and advancement of religion and morals; and protection from foreign aggression. For the attainment of these objects, laws are enacted and enforced. In most of the countries of Europe, however, the last of these objects have received the greatest attention; and to it the wealth and resources of countries have been more especially devoted. The lives of the inhabitants have always attracted the smallest amount of regard from governments, legislators, and political economists; and even from those who administer the laws, unless under circumstances of peculiar atrocity. The numerous circumstances which influence the health and longevity of the community; the palpable causes which produce disease and pestilence; the acts of individuals or of companies, affecting the health or lives of hundreds or thousands of those with whom they have intercourse or concerns, or who surround them; and the multifarious modes in which avarice and the love of over-reaching directly and indirectly sap the springs of life, have never engaged the attention of most governments, and least of all, those of this country, until the magnitude of these evils, the fears of a widely spread pestilence, and the pressure from without, diverted a very small portion of that attention to them which had heretofore been entirely absorbed by the interests of parties, and the advantages of a class. Formerly, and even now, although much less remarkably, literature, in attempting to live upon the crumbs which fell from the tables of placemen and aristocratic partizans, like the parasite gull so well known to the naturalist, fed only on the offal and filth ejected by those whom she worshipped. The sufferings of the poor, the squalor consequent on want and misfortune, and the garbs necessary to the satisfactory performance of important and requisite occupations, were made the themes of poetic derision and prosaic sarcasm by the statesmen and the popular writers of the day! Yet, however foul and degraded the Georgian era of literature may have appeared in several of its epochs, science continued to advance with due majesty, and with a gracious care of the health and lives of those who had become the least cared for parts of the machinery invented for the acquisition of wealth, and who were looked upon by statesmen as the common herd, amongst which pestilence and death might freely revel, as "checks to an over-grown population." Philanthropy went abroad; but in neglecting his home most signally destroyed or enslaved the objects of his foreign care. His very enthusiasm blinded him to the effects of his actions, and diverted him from his domestic duties; but hopes of his return are to be entertained from certain measures which public opinion has enforced, and he may still promote some of the numerous reforms of our social condition that are urgently required, and remove many of the most influential causes of disease and of premature dissolution that degrade while they afflict the community.

3. i. THE PREVENTION OF, OR WARDING OFF, PESTILENCE.— It is obviously the duty of governments, however much they may neglect it, *to prevent pestilence from springing up* in the countries they profess to protect; and *to ward off the invasion of pestilence from abroad.* These are two grand sanatory intentions, the fulfilment of which the community has a right to demand from those who govern and enormously tax it. The second of these has been as efficiently and satisfactorily accomplished as circumstances allowed; but the first has been altogether neglected; and not merely neglected, but sacrificed to class interests. No efforts have been made by those who had the power, but neglected the duties which that power involved, to prevent the habitations of the living, the depositories of the dead, and the aggregations and conditions of the lower animals, from becoming the sources of disease or pestilence. The ignorant builder, who, in many instances,

could hardly write his name, was in no way discouraged from building houses and streets calculated to endanger not only the health of their inmates, but that also of the whole neighbourhood. He might erect houses and streets in any form and position — at the shortest possible distance — with the utmost disregard of ventilation, and without either drains, cess-pools, and sewers. He might favour the accumulation of animal exuviæ as much as he pleased, and in as detrimental a mode as possible to the health of all within many hundreds of yards, and no one could interfere. He might introduce disease and death amongst the whole population of his district, and, instead of meeting with reprehension from the authorities, obtain the reputation of being a spirited proprietor, and accordingly receive a portion of the mammon-worship so generally and so assiduously performed in almost every street, mansion, and house in the kingdom. The capitalist economises his means by the neglect of sanatory measures, which would necessarily involve expense, and the law protects him in doing what he pleases with his own; but it does not deign to protect the lives of those around him from the certain consequences of his ignorance and avarice. Thus London, and most other cities and towns in the kingdom, have increased in size without the least control, or the smallest endeavour to protect the public health; but, on the contrary, with every facility to accomplish the deterioration of it — and with the strongest inducements, in the acquisition of wealth, and hence of consideration, to generate disease. These remarks may be considered over-strained; but let the reader refer to the evidence brought before the "*Health of Towns' Commission*," and published in its reports, and he will find them inadequate to convey the opinions which the numerous circumstances and occasions there described must suggest.

4. A very able and enlightened member of that commission, Mr. J. R. MARTIN, observes with great justice in reference to this subject, that, "if it be the business of government to prevent and to punish crime — to secure the public peace — to enforce industry instead of rapine — and the settlement of disputes by appeal to reason instead of by fraud or violence; — if the well-being of the subject be, in short, the main object of legislation — then would it appear the special duty of the ruling power to secure the health and the life of those who, of all others, stand most in need of its protection against the invasions of individual or corporate caprice, ignorance, or stolid avarice. Here we perceive a moral and political duty of necessity. On this subject it should ever be borne in mind that, where there is disease, there also will be found the seat of poverty and crime. Disease, poverty, and crime in their worst forms are constantly and everywhere found together. The truth then is, that misery and crime produce disease, and disease produces misery and crime, in a circle which revolves in the same calamitous monotony from year to year, of the brief existence of the masses crowded in the worst quarters of our manufacturing cities. Whilst men are in the lowest state of physical destitution, surrounded by filth, vermin, privation, and squalor of every conceivable kind — familiar with sickness and death, and strangers to every comfort — with the mind continually on the rack, or absorbed in striving against physical necessity — or with the animal spirits broken down by its pressure, how is it to be expected that obedience to the laws, and that morals, education, or religion, should find a place? How can a man whose mind is ruined even more effectually than his body — the man to whom moral degradation and physical suffering have done their worst — how can such a man be expected to give a passing thought even to such matters? The thing is impossible."

5. But, not to speak of these higher considerations, the benefits of surrounding civilisation, cleanliness and health, are not for the occupants only of lanes, courts, cellars, and houses, teeming with exhalations from the excretions and other exuviæ of the inhabitants, but extend in various ways to the inmates of mansions and even palaces — to the houses of the rich and the proud — to the dwellings and even to the persons of those who consider poverty and wretchedness the worst of crimes, and who cannot approach either the one or the other, even in the temples of the Almighty, even in the houses of that God whom they profess to worship, without dreading contamination, and derogation from their high positions.

6. *A. The prevention of the generation of pestilence or disease in a country* has been already insisted upon as a duty which the government owes the community. The neglect of it is sure to become the source of calamity, and the extent of that calamity will neither be readily controlled or soon arrested, at least on all occasions of its occurrence. In this climate, the calamities arising out of the sources to which attention is now to be directed, are generally not so prominent as in warmer countries and places, where the progression of the seasons is more regular; but if, owing to the nature of our seasons, they are less remarkably violent, they are more numerous and varied, and they can be shown to be equally destructive in their silent, constant, and unobtrusive course.

7. It must not be supposed that, because the causes of disease to which particular reference is about to be made, and has been made, in various parts of this work, and particularly in connection with the pestilences just considered, have not been proved to be the originators of any of these pestilences in this country, they are, therefore, entirely without influence as respects either the propagation of these pestilences when introduced, or the production of other not less fatal, although more prolonged, maladies. They are, in truth, amongst the most efficient causes of the diffusion and propagation of all infectious maladies; whilst they are the principal agents in the generation of chronic and constitutional diseases, in contaminating the springs of life at their very sources, and in producing decrepitude and mental weakness in the offspring, if, indeed, the blighting influence of these agents during infancy and childhood be survived.

8. *The prevention of domestic causes of pestilence is also the prevention of epidemic maladies, and of numerous chronic and constitutional diseases.* The prevention of those causes has no further relation to the three pestilences above considered than as respects the removal of some of the chief circumstances which favour and give activity to the infection of these pestilences, on the occasions of the introduction of the infection

from abroad; but it has a much more certain, continued, and manifest effect upon the prevalence of the numerous other maladies, which, in our climate, depend upon their domestic causes, especially as they exist in large towns and cities. These causes are so evident to the senses, so disgusting to the sight, so sickening and sensibly injurious to all who come within their spheres, and so very prominently connected with their baneful effects, that it is a matter of the utmost surprise that a more enlightened attention to them, and attempts at their removal, have not long since been enforced by the legislature.

9. *All sanatory measures which should be enforced in a locality* should have for their objects — 1st. The removal of the excretions, as speedily as possible, from the habitations of the people, and the prevention of their accumulation; — 2d. The means or method of their removal should be such as should, as efficiently as possible, prevent the escape of the gaseous and putrid emanations they emit into the atmosphere; — 3d. That a sufficient supply of water should be provided for the rapid removal of putrid exuviæ and excretions, and for other purposes of cleanliness and ablution; — 4th. That animal remains and excretions should as quickly as possible be conveyed to their natural and intended destination, namely, to cultivated fields and soils, with the intention of fertilizing them; — 5th. That the bodies of the dead should not become, from the mode of sepulture, and the situation and crowded state of the places of burial, with reference to the habitations, especially in cities and towns, a source of disease to the living; — 6th. That ditches and marshes should be removed, especially in the vicinity of animal and human habitations, by under-draining, &c.; — 7th. That whilst the supply of water should be abundant, it should in no way be contaminated by the vicinity of burial-grounds, ditches, or marshes; — 8th. The supply of pure air, and the requisite renewal of it in all circumstances, with as little risk of contamination as possible from animal excretions or remains, — from drains, sewers, cess-pools, church-yards, ditches, marshes, &c. In proportion as attention is paid to these topics, so will the health of cities and towns be improved. But I cannot dismiss the consideration of them without further and more particular notice.

10. *a. The prevention of animal excretions and remains from accumulating*, especially in large towns, has always been attended with some difficulty, but it is a difficulty which has rarely, until very recently, been attempted to remove. Indeed, much more frequently, if not almost universally, actual provision has been made in large cities and towns for the accumulation of these excretions to a most astonishing amount, and without any intention of their removal for many years. It was proved before the "Health of Towns' Commission," that these accumulating sources of disease exist in respect of most of the houses of all cities and towns, in the form of privies attached to houses unconnected with drains, and of cess-pools, into which the soil from water-closets and privies, and the foul water used for domestic purposes, flow; and that these cess-pools, privies, and drains exist under and around most of the best residences, and in all the worst, in and about London, and in other cities and towns, and that they have generally no communication with the common sewers and drains, but actually are allowed to accumulate until their overflowing contents compel a recourse to nightmen.

11. The inhabitants who have for so many years calmly submitted to a heavy sewer-rate, from the notion that the sewers formed by their contributions actually carried away the soil and foul water from their houses, now find that they have been deluded, legally swindled; and that, notwithstanding the vaunted drains and sewers of the metropolis, there is no necessary connection between them and the houses, close to which they pass, even where they do pass; that the sewers are few compared with the number of streets, and that comparatively few houses have any communication with them. Thus the contents of privies or necessaries, water-closets, cess-pools, and drains, are allowed to sink into the soil, upon which the houses are built, to poison it, and to contaminate the air within and around the dwelling, the more consistent remains being pent up, and allowed to accumulate without any outlet whatever. As these contents collect and increase, the more fluid parts filtrate through the upper layers of earth or clay, and contaminate the water supplying pumps and springs. The gaseous parts, and those which are carried off during evaporation by the air, more or less infect the air, and destroy the health in various ways, of those especially who live in the lower apartments, and particularly if they sleep in them. During warm seasons the emanations proceeding from these accumulations of animal excretions, and from the ground thus imbued with animal matters, upon and around which the dwelling stands, become almost as injurious as those generated in warmer climates and countries, to which reference has been made above, in respect of the generation of the pestilences just now considered; and would, equally with them, promote the diffusion of the infection of those pestilences as soon as the infection should be imported. Indeed, the accumulated emanations thus arising from the aggregation of individual sources, furnished by thousands of residences, constitute that contaminated state of atmosphere which favours the propagation of the infection of these pestilences; and the absence of these emanations or at least the comparative absence of them in country places, partly accounts for the much slighter prevalence of pestilence in these localities.

12. It is supposed that the circumstance of cess-pools and drains, containing animal matters in a state of decay, being covered over, is a sufficient protection from their injurious influence. But they are not hermetically sealed. There is a constant generation and extrication of foul gases from them; and these gases, and the air contaminated by them, are continually passing off between the boards and crevices of the stones which cover them. In many places of this metropolis, as well as in manufacturing towns, large privies exist, used by the numerous workmen in large and crowded factories; and cess-pools of immense extent which receive the contributions of many houses and work-shops. It is well known that the former are often not emptied for many years, but are allowed to diffuse their odours, and their baneful influence, for many hundreds of yards, in all directions; and it is stated of the latter, that an attempt was made to empty one of them, situated

in a central and crowded neighbourhood; but after some scores of cart-loads of soil were removed, the rods which were employed to reach the bottom of the depository were not sufficiently long for the purpose, and the Herculean task of emptying it—cleansing was out of the question—was relinquished. It was stated also, before this commission, that one of these immense reservoirs of filth and putrid animal matter existed immediately under a school, so that, in addition to the contamination of the air by the congregation of a great number of children in a confined and insufficiently ventilated space, there was the additional evil of foul air constantly rising up from the poisonous sources beneath them.

13. Much has been said of the collections of filth, of the superficial uncovered drains, and other disgusting states of things in former times; and in numerous continental and eastern cities and towns in modern times; and of their influence in originating and perpetuating pestilence. But these sources of mischief are readily swept away by rains; the emanations from them are soon dissipated by the winds; and the grosser materials are carried off and devoured by birds of prey and the lower animals; so that they are actually less injurious than those accumulations of filth and fæcal matters furnished by almost every house in the towns of this country. These fæcal collections are so carefully preserved from these natural means of purification, that the emanations from them continue to be generated at all seasons, and to be extricated within the very walls of the dwelling, in their areas, and under the very windows which are intended to admit fresh air and light. No cold in this climate is so great as to prevent the generation of noisome vapours and gases from these sources; whilst the warmth of summer and autumn increases the extrication of them, and concentrates them in a more humid atmosphere. But it may be asked by utilitarians and political economists, where is the mischief which these admitted nuisances and offences against the senses occasion? Do they produce pestilence? We see no sign of pestilence. To these every well-informed physician will answer, that there has been no pestilence—no plague—because the seminium or infection of plague has not been allowed to be imported. But if it had been imported, or were even now to be imported, especially during summer or autumn, all the conditions requisite to its devastating spread exist in the sources now pointed out. Although protected from this foreign scourge by quarantine laws, the existence of which is now threatened by persons ignorant of the subjects to which they relate, let it not be supposed that these nuisances, these sources of contamination, are unproductive of the most serious effects. To the question, therefore, as to the mischief they occasion, another may be put as to what mischief, evil, or disease afflicting the human frame, may not be imputed more or less to these very remarkable domestic sources. I find it much more difficult to point out a single disorder or malady which cannot be imputed partly or altogether to these causes, than to enumerate the many which acknowledge them as their principal sources. Even where they are not the efficient agents, as in the pestilences above considered, they are predisposing, aiding, and determining causes. They more especially occasion sickness and death, during infancy and childhood; and even when these epochs of human existence are struggled through; and the various affections of the digestive organs and nervous system, and the febrile diseases, and the varied forms of debility which these causes produce, are either partially or altogether removed; there frequently succeed a sickly period of puberty, impaired manhood and premature decay, scrofula, and tubercles in their numerous forms and seats, visceral diseases in countless variety, and mental weakness in endless forms and grades.

14. During the present warm summer (1846), I have had numerous occasions of remarking the very injurious consequences of frequenting those privies in which the fæcal matters are allowed to accumulate. Of three families, every person was attacked with adynamic dysentery, with a low or putrid form of tenesmus, and an erysipelatous state of the anus, extending to the vulva and vagina of the females. In one family, nine persons were thus attacked; and in several other families, and on other occasions, I have traced these affections, which have often been attended by great danger, to this particular cause,—to the influence of the foul and concentrated effluvia, from long-accumulated fæcal matters, upon the mucous surface of the anus and vagina.

15. It is obvious from this, that no such accumulations of noxious agents should be allowed to exist; that drains and sewers should be so constructed as to convey from the dwellings, as rapidly as possible, and without sinking into the soil, or evaporating into and contaminating the atmosphere, the foul materials and animal exuviæ into the main sewers; that the supply of water should be sufficient to aid this object, and that the main sewers should be so constructed as respects their terminations, as to allow their contents to be removed by safe and suitable modes of conveyance, to cultivated grounds for the purposes of manure.

16. *b. The burying of the dead within, under, and around chapels or churches, or in large burying-grounds, situated within, or close to cities or towns*, is amongst the most serious evils of the present state of society, and of existing legislation. The emanations from these places are equally injurious with those proceeding from the sources just noticed, and are, on some occasions, as I have often witnessed, even more strikingly injurious, owing to the greater concentration of the noxious vapours and gases, especially as they emanate from the remarkably crowded burying-grounds and vaults, around and under chapels in the metropolis. And, although numerous states of ill-health and forms of acute disease actually proceed from this cause as well as from that above exposed, the most malignant putrid or putro-adynamic fever, as described under that article, have come before me, and been referred to this source by the more intelligent of those who have been thus attacked. I have, moreover, had demonstrative evidence, that cases of this fever, caused by the emanations from the vaults of chapels in this city, and terminating fatally in eight days from the period of exposure, these emanations at the moment of their impression producing most marked effects, have infected other persons, in the same house with them, with a similar and equally dangerous and fatal fever.

17. The congregation of many hundred per-

sons in a building, opened only once in the week, warmed and ventilated but partially and imperfectly on that occasion, and containing immediately beneath its floors, and surrounded by, thousands of human bodies undergoing putrefaction and decay, must necessarily prove more or less injurious to health; and still more remarkably to the health of those who may happen to inspire a portion of those irruptions of foul air which break forth at intervals from the burying-places, or which flow from the grated openings communicating with the vaults and other places of sepulture constructed under the pews of these chapels.

18. *c.* It is almost unnecessary for me to insist upon the *impropriety of allowing ditches, swamps, or marshes to contaminate the air* in the vicinity of towns, or any human habitation whatever; or to bring supplies of water from places near to these sources of disease, or to burying-grounds. Water loaded with animal matters in a state of decay, or abounding with animalculæ, and the infusoria, is most remarkably productive of diarrhœa, dysentery, mucous and adynamic fevers, or of those typhoid forms of fever which are attended by ulceration of PEYER's and BRUNNER's glands. The means of removing these causes are too obvious to require notice at this place; and ought never to be neglected, although no very manifest mischief may result from them, or no very remarkable outbreak of disease may occur. They, nevertheless, impair the constitutional powers of all within the sphere of their influence; induce, gradually and slowly, visceral obstruction, and numerous chronic maladies, and favour the prevalence by promoting the infection of malignant and pestilential distempers.

19. *d. Crowded apartments and assemblies, and neglect of due ventilation of these, and of the dwellings of the poorer classes,* are amongst the most productive causes of disease, and of the diffusion of pestilence, wherever pestilential infection is introduced. The residences of the poor are not merely overcrowded, but also ill-ventilated, owing both to the prejudices of many of this class, and to the situation of them in courts, lanes, narrow streets, and cellars. A free and thorough ventilation is often impossible in these situations; and, in addition to this cause of disease, and to the evils resulting from large numbers residing and sleeping in each of the several apartments into which the house may be divided, there are often superadded, the foul air proceeding from privies, cess-pools, and drains, and the other sources above described (§ 9. *et seq.*). Thus the air which is respired by persons thus circumstanced, is contaminated both by those who breathe it and by the several causes just alluded to; and in this state of contamination it is allowed, moreover, to stagnate, to become still more foul, and to concentrate more fully the emanations from the bodies of those who respire it, and from the several sources above indicated. Among persons thus placed, it must be expected that all infectious maladies will not only make rapid progress, and prevail extensively, if not generally, but assume a more malignant character than in other and more favourable circumstances.

20. It is not, however, merely by favouring the extension and malignancy of infectious and pestilential maladies that these causes act injuriously on the classes of the community more especially subjected to them, but also by actually generating infectious diseases, and even by imparting an infectious character to several affections which would not otherwise present it. In this way fevers are generated, and are spread from these original sources to the abodes of wealth and rank—to the very families and persons of those, by whom the wants of the lower classes were neglected, for they could not have been unknown, and to whom they were an abomination; for, if they had been objects of compassion, they would have been long since considered with the intention of devising a remedy for such of them as admitted of remedy.

21. The want of due attention to ventilation in the construction of work-houses and other places for the reception and medical treatment of the poor, aided by insufficient and unwholesome food, has been no mean cause of the production of low fevers, diarrhœa, and dysentery among the inmates of these places, but also of the prevalence of these diseases in the vicinity. The crowded states of these abodes of poverty and disease, and the several other sources of disorder connected with them, certainly do not limit their baneful effects to the places in which they exist, but extend their malign influence on many occasions by various modes of infection, in several directions, and to more than one class of the community. If a rigid inquiry were made by competent persons into the states of workhouses, lunatic asylums, charitable institutions, chartered and endowed schools, penitentiaries, and other places where a constant residence or daily congregation of a number of persons or of children is required, how few would appear unexceptionable in every respect. In many, ventilation is imperfect or only partial; in others, the sleeping as well as the sitting apartments are most disgustingly overcrowded; in most of them, imperfect ventilation is associated with over-crowding, and not infrequently also with foul emanations from privies, cess-pools, and drains; in some, one or more of these ills are conjoined with insufficient and unwholesome food, and with want of due exercise in the open air; and, in not a few, all these evils are combined, in various states according as one or several of them assume more or less prominent characters, or are moreover associated with neglect of cleanliness of person and of residence, &c. In what condition could the inmates of a lunatic asylum have been in, as respects all the circumstances which contribute to health, and especially those to which attention has been directed above, when 112 out of 450 died in twelve months, as proved by Mr. WAKLEY in the House of Commons?

22. *e.* There is nothing which tends more to injure health, and to develop scrofulous and tuberculous and other chronic diseases among children and young persons, *than numbers sleeping in the same apartment.* The evil is great in proportion to the number relatively to the size and imperfect ventilation of the chamber; but, when this is conjoined with others, as it often is, more particularly with foul emanations from privies, cess-pools, and drains, with insufficient or unsuitable food, and with insufficient exercise in the open air and in sunshine, the injuries thereby inflicted upon the constitution in various forms of acute as well as chronic disease, and the malignancy and danger

imparted to infectious and febrile distempers, when they break out in these circumstances or places, become the most alarming, and often the most hopeless, to which medical aid can be called. The circumstance of numbers being compelled to sleep in the same chamber has been fraught with mischief, not only to the physical powers and the bodily health, but also, and not less remarkably, to the moral feelings and dispositions through life; and although most especially detrimental to children and young persons, it is also very seriously injurious to grown up people. What is the state of health in children in large schools and institutions, where, from five or six to fifty or sixty children sleep in the same apartment; the smaller numbers in boarding schools, and the large number in public institutions, as Christ's Hospital School at Hertford? The data necessary to a correct answer to this question are not before me, but I will assert, from no small experience of the bad effects of this, and other conditions of these schools and institutions, as favouring the development and spread of disease, that the extent of the mischief thus produced is not even suspected by those who are most actively concerned in their management. The evils which result from causes connected with the arrangements of these institutions are even not seen, and when they are seen from their prominence or extent, they are not referred to their actual sources.

23. Nor are some of the evils which may be traced to the congregation of great numbers of children during the day in small school-rooms much less remarkable than those above adverted to; but when it is known, as indeed it has been proved before the "Health of Towns' Commission," that these assemblages, of several hours' duration, actually take place in rooms immediately over immense cess-pools, or in chapels steaming with emanations from the dead bodies in their vaults, or from those putrifying around the walls, or from both productive sources, it may, without great impropriety, be assumed, that the wisdom of man, even of him who thinks himself the most divinely inspired, is but blindness, foolishness, and presumption; and that, in his attempts to accomplish what is laudable in itself, he is actually occasioning acute disease, or contaminating the constitution during life, and occasioning, moreover, that state of contamination which will be imparted to the offspring during many generations. The collection of numbers of persons in factories, the imperfect ventilation of many of them, and the modes of warming and lighting them, are not amongst the least of the evils to which the health of the working classes is exposed. Science could not render a greater service to the community than in rendering her aid to the reformation of these and similar ills, which weigh upon the physical and moral powers of the productive classes; and affect equally their health, happiness, and offspring.

24. *B. The prevention of foreign pestilence.*—The duty of government to prevent the introduction of pestilence from abroad, is as obvious as that to prevent both the existing and predisposing causes of pestilence, and of distempers almost as fatal as pestilence, from being generated and allowed to exist at home. Whilst the former has been entirely neglected in this country, the latter has received a very proper attention. Yet, although the neglect of all domestic sanatory measures has met with little reprobation, the enforcement of the quarantine laws has experienced much opposition; and restrictions of every kind, calculated to hamper commercial speculations, have been condemned by those who consider a small pecuniary loss of greater importance to them than the contingent occurrence of a great public calamity. But, as Mr. M'CULLOCH justly remarks, "quarantine is not a matter in which innovations should be rashly introduced; whenever there is doubt, it is proper to incline to the side of security." In this country, we have to guard against the introduction of the three great pestilences above considered, and the risk from each, although remote, is probably almost equal. The frequent importation of plague into this and other European and northern countries, before the institution of sanatory measures; the increased risk occasioned by the very rapid communication between all parts of Europe and those places in the Levant and within the tropics, where plague and hæmagastric fever prevail, and our recent experience of the pestilential cholera are circumstances which should not be overlooked in our estimate of the probabilities of a visitation from either of these distempers, and which ought to influence those who are bound to protect the public, whilst they give every facility in their power to trade, in their deliberations and enactments.

25. In the United States, more especially in some of them, and in many of their large commercial cities, quarantine has been either imperfectly enforced, or not instituted at all, until recently. The great distance between them and the Levant, and the nature of their climate, gave them little cause of alarm as to the introduction of plague: and, until lately, the hæmagastric pestilence, so generally and destructively prevalent in the West Indies and on the coast of Mexico, and so frequently epidemic in some of their chief cities, was viewed entirely as a domestic evil, against which quarantine and other sanatory measures could not possibly prove of any avail. From 1751 until 1791, this pestilence made its appearance in New York on several occasions; but after the latter period it appeared more frequently and more destructively, as might have been expected from the increased size and population of the city and the more frequent intercourse with places where it prevailed. It even occurred during two or three successive years, and was seldom absent for a longer period than this, until 1822, when it prevailed most fatally. Since that year quarantine regulations have been strictly enforced, and the distemper has not appeared again in that city—now a period of nearly a quarter of a century—although it has scarcely been a year absent from vessels detained in quarantine, and in the quarantine hospital. (See *the Report of a Committee of the House of Assembly of the State of New York on the present Quarantine Laws.* 8vo. Albany, 1846.)

26. Can any stronger proof of the propriety of enforcing these regulations be adduced than that to which I have now referred, and which may be perused with numerous other valuable documents in the official report just named? It is well known to most physicians, that Dr. RUSH, celebrated not only as a medical writer but as a

statesman, at an early period of the rising greatness of the United States of America, laboured with great zeal to prove that the pestilential yellow fever was of domestic origin. But the authors of the Report just referred to state that "this opinion was nevertheless somewhat modified before he ceased exerting a prodigious personal influence upon the mind of man: for he says, 'that it was even produced in Philadelphia from the effluvia from a chest of unwashed clothes which belonged to one of our citizens who had died of it in Barbadoes.' This influence, says Dr. Monette, has doubtless been the destruction of thousands; and had it not been so great in the medical community of the United States, our northern sea-ports would not have been so long subject to the pestilential visitations of yellow fever. The southern ports, still acknowledging a vassalage to his authority, and to his arbitrary dictation, through his disciples, to this day immolate hundreds and thousands of victims annually upon the altar of a blind credulity." (*Report, &c.* p. 21.)

27. Can it be possible to adduce a stronger instance than that to which this quotation refers, of the baneful influence of authority upon the minds of medical men? Or is there more satisfactory evidence required, not merely of the importation of the distemper to which it refers, but also of the necessity of enforcing quarantine regulations for the protection of the public? But the instance thus adduced by Dr. Rush is one, not only proving the importation of this pestilence, but also showing the facility of such importation; and, when the nature of the means is considered, the great difficulty, however strict quarantine regulations may be, of preventing it through the medium here indicated. Dr. Lind states, that a trunk of clothes was brought from the West Indies into Philadelphia in 1741, containing the clothing of a young man who died of the yellow fever; and he says, that all the persons present when the trunk was opened contracted the disease, which was afterwards propagated to other persons in the city. The Reporters to the House of Assembly of New York state, that a vessel, which had arrived at New Haven from Martinico, "had brought home a chest of clothes which belonged to a sailor who died of the yellow fever at Martinico;" that it was opened in the presence of four persons named in the Report; that three of these four in a short time afterwards died of this fever; and that the pestilence was propagated from these to the town of New Haven. (See *Report, &c.*, p. 17.)

28. Now I have adduced these facts, not because they are strong proofs of the importation and infectious nature of the pestilence to which they refer, for, after what I have stated in the preceding articles, no additional facts are required, but because they furnish the strongest evidence of the necessity of quarantine restrictions, and at the same time show the great difficulty of so enforcing them as to prevent the introduction of those articles and effects which are most likely to propagate not only this, but also the other pestilences. I have not the least hesitation in maintaining, and I do so from personal observation and knowledge of the fact as respects two out of the three pestilences here considered, that there is more risk of the importation of them from body and bed-clothes and foul linen of those who have been affected with them, than from the persons of the infected, or from any other source whatever. Every person who has seen much of the communications between distant places by means of trading vessels, who has travelled much, or who has voyaged frequently in those vessels, will admit the difficulty of preventing clothes and linen from being landed, and the frequent neglect of exposing infected articles of this description to due ventilation and cleansing before they are landed. Vessels are even not infrequently, especially in countries where the restrictions are loosely observed, allowed to continue in quarantine until the period is elapsed without the clothes or other personal effects of individuals having been opened up or aired; and not rarely are these articles, more especially dirty linen, sent on shore or smuggled away, without the guards either knowing the occurrence, or being able to prevent it.

29. My limits will not permit me to notice the several regulations requisite to the due enforcement of quarantine. These regulations should be based upon the numerous ascertained facts mentioned in the course of the preceding inquiries; and they should be enforced with a full knowledge of the deceptions so frequently practised or attempted, in order to avoid the detentions requisite to the observance of the law. With highly qualified and duly remunerated health-officers, there can be little reason to dread, either too great severity on the one hand, or too great laxity on the other, even should much be left to their discretion. My object at this place is merely to show the importance of, and necessity for, such restrictions, and to insist upon the strictest attention being given to the bed and body-clothes of all persons who may have been infected, or suspected of being infected, with these pestilences; for, when the numerous ways by which these and other personal articles and effects may pass, from infected places and vessels, to persons at a great distance, even before they are opened up or exposed, are duly considered, it cannot any longer be a matter of surprise, that the distempers which they propagate are so often traced with difficulty, or even not traced at all, to their several sources, and through their several channels.

30. The propriety of enforcing quarantine regulations does not rest upon a few authorities merely. An outcry has been raised, by persons interested in their abolition, that they are supported only by those who are appointed to enforce them. What possible interest can I have in contending for them? What other interest had most of the ablest writers who have advocated them in this and in other civilised countries, than the cause of truth and the interests of humanity? Dr. J. Bayley, in his correspondence with the mayor of New York, after adducing numerous proofs of the importation of pestilential yellow fever into that city previously to 1822, concludes as follows: "I cannot suffer this opportunity to pass, without expressing my firm conviction, that rigid quarantine regulations are essentially necessary to guard the inhabitants of our commercial cities against the introduction of pestilential and infectious diseases." (*Report, &c.*, p. 79.) What also say other eminent physicians of that city on this important topic? Dr. Townsend, whose experience of the hæmagastric pestilence has been

obtained in New York, in the Havannah, in the Bahama Islands, in Charleston, in South Carolina, and in the West Indies, thus remarks on the crude speculations and productions of some of those who have recently written on the subject now under consideration. "The true character of the pestilential yellow fever, commencing with the monographs of the earliest writers, as TOWNE, HILLARY, WARREN, ROUPPE, &c., and the not less masterly descriptions of those who succeeded them, as CHISHOLM, BLANE, LINING, (of Charleston, S. C.,) HOSACK, and a crowd of others, together with the more recent productions of STROBEL of Charleston, and MONETTE of Washington (Mississippi), &c., have been entirely lost sight of, to give place to the more congenial and crude speculations and misrepresentations of empirical adventurers, many of whom, with mercenary motives, designed to flatter the authorities of different governments with the delusive hope that commerce might be disburthened of every such restriction, as a relic of barbarism, have not hesitated to assert, and to disseminate on the subject of yellow fever, a tissue of heresies and errors, which every practical physician, and every common citizen acquainted with this disease, as it has prevailed in our seaports and in the West Indies, know to be without the shadow of a foundation."

31. Dr. VACHE, of New York, observes, "that yellow fever has not appeared in that city for nearly a quarter of a century, and not since the present health laws have been rigidly enforced; therefore, let us not forget in our zeal for innovation and improvement, the good old maxim, 'Let well enough alone.' Admit they are, in a measure, restrictive to commerce and burdensome to the merchant; will any calm observer deny they are alike protective of his life and conducive to his interest? The pecuniary loss of a hundred years by the quarantine establishment, cannot equal the ruin and desolation of a single season of the pestilence. Who does not shudder at the memory of closed dwellings, the suspension of business, the shunned city, the quarantine abroad, and the sepulchres of hundreds, during the summer of 1822." (*Report, &c.*, p. 97.)

32. Similar opinions to these have been given by Dr. FRANCIS, and other eminent physicians in the United States; and furnish the basis on which the Report is founded, to which I have referred, and which reached me after the chief part of the above article was put to press. These fully confirm the views which I have entertained, as well as furnish most conclusive evidence of the necessity of enforcing quarantine regulations. Dr. FRANCIS, as well as many other eminent physicians, has shown that the hæmagastric pestilence has been imported into many places, and into the quarantine districts of the United States, when the thermometer ranged above 75°. Now, if the "Eclair steam-ship had arrived in this country when the temperature was at this elevation, or at any period during the summer of 1846, and quarantine regulations had either been neglected, or imperfectly enforced, what might have been the consequences; and what may still be the consequences if these regulations should be so far relaxed as to allow of the admission of the foul bed or body clothes of persons who have died of any of the pestilences just considered, especially during states of temperature and of the air favouring the infection of these pestilences? I fully believe that pestilential cholera was introduced into various places both in this and in other countries by foul clothes, and that there is more risk in either of these distempers being imported in this way, than by personal communication—than by the infection having been imparted in some place where the distemper prevailed, and remaining latent in the infected person for a number of days, so as to break out only shortly before, or soon after, arrival at the place of his destination. Certainly, all the contingencies of the malady—infection by close communication, by opening up the clothes of infected persons, and such articles of traffic as are calculated to imbibe infectious emanations, or are likely to have been exposed to them; the period which has elapsed from the occasions of such infection and of such exposures, and the several circumstances favouring or counteracting infection, even admitting its presence, as temperature, humidity, or dryness of the air, cleanliness, ventilation, &c., ought severally to be considered when framing regulations for warding off pestilence, and when carrying these regulations into effective operation.

33. How far it may be prudent to relax these laws in respect of merchandise, even still further than they have been in this country, cannot be stated absolutely and with confidence of perfect safety; for several articles of traffic belong to the same category as apparel and bed and body clothes, and retain and convey the poison long and far; but caution should be used in such relaxations; and the facts should not be overlooked, that the most obvious and important advantages have already accrued from the recent institution of quarantine laws in Constantinople and other places in the East, and from a more strict enforcement of them in the cities of the United States.

34. To the entire neglect of *government measures of prevention*, and to insufficiently strict quarantine regulations, the extension of the choleric pestilence throughout the countries of the east, and through Europe and America, are entirely to be imputed. The difficulty, however, of completely enforcing these measures, and the liability of evading them in all countries, particularly those which are continental, and have an extended boundary, which are thickly inhabited, particularly on their frontiers, have large and populous frontier towns and sea-ports, and enjoy a rapid and extensive commerce, either by sea or land, are so great, that numerous instances of their infraction must occur, and the chances of the introduction of the pestilence be thereby increased. These circumstances fully account for the importation of the malady into the principal towns and sea-ports of Russia and Prussia; its appearance in Moldavia, Hungary, Austria, Vienna, Dantzic, Hamburgh, &c.; and the negligence with which quarantine regulations are usually resorted to, fully explains the introduction of this pestilence into Egypt, into this country at various ports, as well as into numerous places in other countries, where stricter precautions might have reasonably been supposed to prove successful.

35. As intimately connected with all regulations of quarantine, the period which elapses from the impression of the morbid cause upon the frame, and the full development of the disease, requires some notice, but, unfortunately, sufficient

acts have not been obtained, and those which have been observed are not sufficiently precise to furnish us with exact data on this topic. In respect of plague, eleven or twelve days have been assigned as the extreme period, whilst other observers have stated fourteen days to be the longest time. Various circumstances, however, serve to show that the full development of the morbid actions constituting these diseases may take place very soon, even a few hours, after exposure to an intense degree of the exciting causes, or when the state of predisposition to become affected has been great; whilst, on the other hand, several, perhaps many, days often elapse before a marked effect is produced. As to the exact length of time which may, in extreme cases of this kind, thus elapse, I have no means of stating, especially as respects pestilential cholera and hæmagastric fever; but even taking it for granted that a few days merely will often form this period of latent or smouldering action, it becomes obvious that a person may have been exposed to a source of infection, previous to leaving an infected place, that he may travel a long distance, especially in these days of rapid locomotion, and yet not experience the disease, until some time after his arrival in a healthy situation, when he may be attacked, and thus he will introduce the pestilence.

36. The unknown duration of the interval which may elapse between the infection of the malady and its full development, must render it doubtful what should be the prescribed period of quarantine; but there can be no doubt of the propriety of regulating it according to the length of time during which persons, or vessels, have been on their passage from an infected place, provided that no source of infection existed in their course. I believe that nothing can be objected to the measures which have been resorted to in this country respecting ships; but it remains a question in what point of view articles of merchandise are to be considered.

37. That the chances of infection by articles of this description are much less than by persons may, I think, be safely taken for granted; but I still consider those articles which are most likely to have imbibed a portion of the effluvium of the affected, as made clothes, articles of bedding, furs, cotton, woollen, silken, and linen furniture, and rags, to be calculated to transmit the infection. In all cases, therefore, these should be subjected to precautionary measures, and particularly to a full exposure to the open air. It is astonishing how very long woollen and silken bed and body clothes, especially, will often retain animal effluvia when closely packed together, or excluded from ventilation. This must be familiar to every medical man who has been in the habit of continuing for a considerable time, or to be frequently in dissecting-rooms; for the animal miasm which his clothes have there imbibed will be sensibly felt months afterwards if they have been put in a close place immediately after they were saturated with the foul air.

38. That sanatory measures will succeed in averting a visitation of this pestilence, will much depend upon the nature of the frontier of a country — upon its extent — the number of populous places in its vicinity, and the nature of the intercourse between it and the infected parts. In respect of this last-named source of infection, illicit intercourse, or smuggling, is one of the most probable channels through which the disease will be communicated; and when the population is thick, and the towns large and numerous, the chances of pestilence being introduced in this way are much greater than by regular commercial intercourse, inasmuch as the latter is more or less under the control of sanatory regulations, whereas the former avoids them altogether. Besides bed and body-clothes, foul linen, and similar infected articles are more likely to be conveyed clandestinely than by ordinary commercial channels.

39. ii. Of the Arrest of Pestilence when introduced or prevailing. — When pestilence is introduced, the measures which should be taken to arrest its progress must necessarily depend upon the extent of its diffusion, upon the number and situation of the places in which it has appeared, and upon the nature of the pestilence itself. As regards the last of these, it may be premised — 1st, That the *hæmagastric pestilence* can be introduced into a country only where the temperature is above 70°; and when the air is close and humid, and the elevation not greatly above the level of the sea; that it is rarely disseminated when the situation is well ventilated, and not thickly inhabited; that frost destroys its infection, and that it attacks the human frame only once. — 2d, That the *septic or glandular pestilence* may be introduced into a country at all ranges of temperature, from 35° to 75°; that it may remain dormant in favourable circumstances at a temperature either below 35° or above 75°, although these more extreme ranges are more likely to destroy its infectious power; that a close, humid atmosphere, with the other circumstances already noticed (§§ 9—23.), favour its spread; and that a previous attack generally protects the system from a second, although not so fully as observed in respect of the hæmagastric distemper. — 3d, That the *choleric pestilence* may be introduced, and prevail in any range of temperature observed in temperate countries, although it is most rapidly and generally diffused in warm, humid, still, and sultry states of the air; in crowded situations, or where intercourse is most frequent, as in camps, barracks, transports, and ships of war; where also the other pestilences are more rapidly and universally propagated.

40. It has always been observed that, when either of the pestilences has appeared in a country, the places nearest the frontier or coast, or in most intimate and frequent communication with a previously infected part, are the first attacked. It is obvious, that when once introduced into a populous and commercial town, surrounded either by other towns, or by a dense population, the difficulty of preventing its extension is greatly increased beyond what obtains when it appears in a walled city, or in an isolated locality. For in all places depending chiefly upon manufactures, and upon commerce with distant or foreign parts, measures sufficiently restrictive to confine the malady there until it shall have subsided or exhausted itself, will be productive of so much distress, by throwing many persons out of employment, and by abridging the means of subsistence, and so injure the health of the community, and predispose to the extension of the distemper, as to induce all classes to combine to evade them, until the pes-

tilence will spread notwithstanding these restrictions. The failure, however, of such measures is not to be viewed as it has been by the anti-infectionists, as a proof of the justice of their cause, but of the impossibility of preventing communications, indirect or direct, between the sick and the healthy, in these circumstances.

41. *A. When pestilence first appears in a populous city or town thus circumstanced*, the chief measures of prevention ought to be directed to the infected habitations, as will be pointed out hereafter, and to the infected persons and things which introduced the distemper. Those attacked should be immediately removed, in conveyances constructed for the purpose, to an isolated hospital, devoted to them only; and suspected persons, or those in close communication with the infected, but not yet attacked, ought to be removed to another hospital or place of observation near to, but not connected with the former, to which all should be conveyed as soon as they are seized. All intercourse between the inmates of infected houses, and of those adjoining, should be prevented, or placed under rigorous restrictions; and thus the pestilence may be strangled at its birth. In all outbreaks of pestilence, the attendants, and those employed in removing the infected, ought to be selected from those who have been attacked on some former occasion; and they should be provided with linen, canvas, or other suitable dresses; and the medical attendants ought not to leave persons infected by either of these pestilences and proceed abroad, or to visit other persons, without changing the clothes, in which patients in pestilence were seen, for other garments.

42. If pestilence spread notwithstanding these restrictions and precautions, more especially in large towns, and a thickly inhabited surrounding country, more advantage will accrue from the individual means of prevention hereafter to be noticed, than from measures which aim at that which cannot be enforced or accomplished, namely, the maintaining a strict non-intercourse with the vicinity. Where, however, this object may be attained with reasonable hopes of success, it should not be neglected. But in a place where, besides a frequent intercourse with other parts by shipping, an hourly communication by means of stage-coaches, waggons, canals, and rail-roads, is kept up with other towns in all directions, I cannot see that quarantine or sanatory *cordons* can be strictly maintained, or regulations be enforced in such a manner as to prevent the extension of the malady. How can various effects and articles, even those most likely to transmit the pestilence, be sequestered for the purpose of purification, and yet avoid all chances of conveying it? And how, especially, are the hundred or even thousands of persons whom their avocations daily call to adjoining parts, many of whom may have been exposed to infection previous to their departure, to be placed in quarantine, or in observation, for a sufficient time to avoid all chances of their conveying the disease to the places of their destination?

43. I conclude, therefore, that where a strict quarantine, or sanatory measures calculated to confine the pestilence to the place of its introduction, cannot be maintained, the mischief resulting from the attempt will be greater than the benefits which will arise to the community. But that, where they may be enforced, owing to the nature of the locality, the employments of the population, the distance from other towns or populous places, and the thinly inhabited state of the surrounding country, they should be adopted, notwithstanding the temporary losses or even distresses of the place thus sequestered, for the good of the few should give place to the safety of the many.

44. *B. When pestilence is introduced amongst troops, in armies, or in garrisons*,—the very best results will be generally obtained if decided measures be early resorted to, as shown by those devised by Sir W. PYM at Gibraltar. Notwithstanding the existence of Medical Boards, in this country, and in each of the Presidencies in the East Indies, there does not appear to exist any code of regulations, by which either the young and inexperienced medical officer, or the more responsible and experienced army physician may be guided wholly or in part, or which he may mould to circumstances. In 1831, Sir DAVID BARRY, whose talents were great, and sphere of observation extensive, published several suggestions on this subject, with reference especially to the hæmagastric pestilence of Gibraltar, but applicable to all outbreaks of pestilence in armies or garrisons. How far they have been adopted in garrisons or among troops liable to be infected by either pestilence, I am unable to state: but there was formerly, and I believe that there still is, in all departments of the army, more especially in the East Indies, a most remarkable neglect of sanatory or precautionary measures. Those which I have now to offer, are in several respects the same as were recommended by Sir D. BARRY.

45. *a.* When pestilence shall have been proved to exist within a fortress, garrison, or encampment, let the sick and the suspected be immediately removed without the walls, or placed in tents in dry, airy, and open places, or in hospitals, or places fitted up as hospitals, when these are more favourably situated or circumstanced, and there kept effectually separated from the healthy, unsuspected, susceptible part of the inhabitants.

46. *b.* Let the infected houses and goods be kept in strict quarantine, and purified by water, air, fumigations, and every other means that may be thought advisable; great care being taken that these expurgatory measures be executed by non-susceptible persons, or those who have been attacked by the pestilence on former occasions of its prevalence.

47. Let no time nor labour be thrown away, at this most important crisis, on cleansing drains or privies. Experience has already proved, most fully, both in Cadiz, in the great epidemic of 1800, and in Gibraltar in 1828, the perfect inutility, nay, the absolute mischievous tendency of this measure, when adopted after the pestilence has commenced, with the view of arresting its propagation.

48. *c.* Should the infection appear to spread within the territory or fortress, notwithstanding the removal of the first sick, all theories must be abandoned, and one established fact must, alone, guide all our measures, viz. *that the disease will stop as soon as the susceptible are separated from contaminated places, persons, and things.*

49. *d.* Since, however, it would be obviously impracticable to remove all the susceptible from a fortified town, or garrison, at once, when an epidemic breaks out after a long interval of public health, and when, besides a large portion of the civil population, the whole garrison may belong to this class, as was the case in Gibraltar in 1828, all the moveable sources of infection and fomites should be sent beyond the walls, and as many as possible of those capable of being affected by such sources as cannot be removed. The civil hospital of a fortified town should also be transferred, with its whole establishment, to the open ground or any situation as above (*a*) directed, to serve as a nucleus of a civil lazaretto, on the very first breaking out of pestilence. The regimental hospital also should be sent out, as the corps to which they belong happen to be attacked. No family or person after having been once contaminated should be allowed to remain an hour in a fortress or fortified town, particularly at the commencement of an epidemic, but should be removed to the places above indicated, where they should be strictly secluded or placed in rigorous quarantine.

50. *e.* Temporary emigration should be encouraged amongst the healthy, uncontaminated, and unsuspected civilians; and the whole susceptible population, civil and military, should be scattered over the open ground and adjoining country, as widely as circumstances will admit, due care being taken that the places or ground occupied by the sick, suspected, and the hospitals should not be too nearly approached. (*a*) Whenever a regiment becomes infected, it should be immediately encamped outside the town, city, or fortress, if it can be spared; but if it cannot, it should be removed to as open and as well-ventilated a place as can be obtained, and the infected instantly carried to the hospital.

51. *f.* The sanatory division of the healthy into the susceptible, and the non-susceptible or those previously attacked, naturally dictates the classification of the sick into the decidedly infected, the suspected, and the unsuspected. There should, therefore, be three distinct hospital establishments, viz. 1. The foul lazaretto for pronounced cases. 2. The lazaretto of observation, for those cases which may, or may not, turn out to be infected. 3. The free or clean hospital, for accidents or non-susceptible sick. All the attendants of the first and second establishments, medical, clerical, and others, should be kept, if possible, in quarantine.

52. *g.* The bed, bedding, and every thing personal to the sick soldier, sent to either of the two first hospitals, should follow the fortunes of their owner. If the sick man should happen to die, his effects will thus remain where they can do no further mischief, viz. in the foul hospital; should he survive, they accompany him to the convalescent depôt, and thence, after having undergone the most careful ablutions, fumigations, &c., to the suspected quarter within the fortress, on his return to duty.

53. Hospital bedding, properly so called, should be used, as in time of public health, in the clean hospital only. This, of course, implies that the bed and bedding of the unsuspected sick need not be removed from the tents, or quarters of the healthy.

54. *h.* There should be three descriptions of camps and quarters, corresponding to the hospital establishments; the foul, the suspected, and the clean, or free. These should be kept distinct during the epidemic.

55. Convalescents, from the foul and suspected hospitals, should be returned to the fortress, after their recovery, placed in suspected quarters, and appointed to the lightest duties at first, distinct from the uninfected, until the return of public health.

56. *i.* The guards, and all other duties within the town and in the sheltered situations, should be reduced to the minimum consistent with the safety of the fortress; and, as soon as the original and convalescent nonsusceptible soldiers are sufficiently numerous to perform these duties, the susceptible should no longer be permitted to participate in them.

57. *k.* The epidemic sick should, as far as practicable, be treated in detached tents, huts, or sheds, so placed and constructed as to admit of the most perfect ventilation. It will not be enough for the protection of the susceptible, nor for the benefit of the sick, that the latter be sent outside the gates. They must be so placed as not to be sheltered by the outworks, from currents of cool air.

58. *l.* Should it so happen that troops in garrison, or otherwise in service, cannot furnish a sufficient number of non-susceptible (formerly attacked) orderlies for attending upon the infected, civil attendants of that class should be employed from the commencement.

59. *m.* In the pitching of tents, and particularly in the erection of boarded sheds, as temporary hospitals, places of seclusion, observation, &c., care ought to be taken that they be not huddled too closely together; and that they be so placed in regard to each other, as to allow a free passage for currents of air; for nothing tends more effectually to prevent and to destroy the propagation of infection than open space, and perfect ventilation.

60. *n.* The first and most important steps towards the saving of human life, on the breaking out of pestilence, being the early detection of it, and the firm, unhesitating announcement of its existence to the proper authorities, the chief medical officers, or those best acquainted with its characters, should carefully observe and report upon all cases of sudden attacks, and of malignant features.

61. *o.* When corps, detachments, reinforcements, or armies are marching or changing quarters, care ought to be taken by commanding officers to cause all quarters, barracks, and encampments to be inspected by trustworthy and experienced medical officers, in order to ascertain their cleanliness, salubrity, &c.; and, as far as possible, the state of health of the previous occupants, and the existence or non-existence among them of any malignant, infectious, or febrile disease. The three pestilences above considered have severally been often propagated in this way to both troops and civilians; those departing carrying with them and imparting on their route the infection to others; whilst healthy troops have rapidly been infected upon arriving in the contaminated quarters which had been relinquished to them. This shows the necessity of using the most efficacious disinfecting means to all quarters and barracks that are in the least suspected, before healthy troops approach them.

62. *p.* When troops or detachments are upon march, care should be taken not to allow any of the men, or even of the officers, to enter towns or villages before the state of health of such town or village is inquired after by the principal and most experienced medical officer; and this inquiry should be made at the chief authorities and medical practitioners of the place. Want of attention to this, and to the immediately preceding precaution, has been the cause of the infection of healthy corps, on numerous occasions in the East and West Indies, with the pestilential cholera and yellow fever.

63. *C. When pestilence is introduced into ships, especially transports, ships of war, and emigrant vessels,* it will be most difficult, if not impossible, to prevent its extension to all susceptible persons in such vessel. Hence the necessity of the utmost precaution in preventing communication with ports in which even the suspicion of the existence of pestilence may be entertained. Trading vessels are, however, often bound to ports where one or other of the pestilences above considered is more or less prevalent, or where it sometimes breaks out during the continuance of the vessel in the port; and in such circumstances the infection of one or more of the crew generally occurs, for sailors usually frequent those places in which a pestilential malady generally makes its first appearance, or most commonly lurks, awaiting susceptible subjects, especially in regard of plague and hæmagastric pestilence, for its outbreak. Besides the infection introduced in the persons of sailors infected on shore, infection may be introduced in clothes, especially such as may have been previously worn, purchased by them and brought on board. Vessels also may be infected by incautious communication with other vessels, especially in the Mediterranean, and on the coasts of Africa and America, and more particularly with slave-ships.

64. When a pestilential malady thus appears in a vessel in port, the circumstance should be dealt with as follows: — If the vessel have been infected in the port, the distemper existing at the time in the port or its vicinity, the person or persons attacked ought to be instantly landed and taken, with all the precautions against the diffusion of the infection, to the hospital or place provided for pestilential cases, unsusceptible or formerly attacked individuals being employed for the removal, if they can be obtained. The vessel should be removed to some distance from others, and ventilation and purification resorted to. If the vessel have conveyed the disease from an infected place to a healthy port, especially during seasons and temperature which favour the propagation of the distemper, communications of all kinds ought to be strictly prevented with the infected vessel. She should be instantly placed in quarantine, in a suitable place, and health guards sent on board. The persons already infected ought to be sent to the quarantine hospital, and the susceptible non-infected removed to an observation hospital, ship, or place, and their clothes be carefully ventilated, cleansed, or fumigated. The vessel and articles in her capable of imbibing infectious emanations should be purified by non-susceptible persons.

65. The greatest risk of the introduction of pestilence, and of the diffusion of it among the crew, arises from the concealment, on the part of the captain of a trading vessel, of the illness or death of any of his passengers and crew, and from the preservation of the bedding and clothes of the infected, which are often concealed and smuggled on shore; or even openly preserved and sent home to the relatives of the deceased. It has been frequently found in the quarantine ground at New York, that the hæmagastric pestilence has reappeared in vessels after purification had been, as was supposed, sufficiently resorted to. This failure of the usual means of dis-infection, in respect of these vessels, may have arisen from some articles of clothing or bedding having escaped notice or sufficient purification, or from the return of such articles to the vessel without due ventilation and cleansing; or from the circumstance of the infection having remained longer latent in the system before it developed its effects than is generally believed to be possible.

66. When the hæmagastric pestilence breaks out in a vessel within the tropics, it has usually been recommended, and practised, to proceed forthwith to a colder climate, or to latitudes in which the range of temperature is below 60°; all the usual means of ventilation and dis-infection being at the same time employed. In some circumstances this measure may be judicious. But it should not be depended upon, when the vessel, especially a ship of war, or transport, is so circumstanced as to admit of the instant removal of the infected into a quarantine or other appropriate hospital, and of the susceptible non-infected into an observation hospital or ship, and of the immediate dis-infection of the ship. The great errors, in many instances of the outbreak of this pestilence in war-ships within the tropics have been, — 1st. The non-recognition of the distemper by the medical officers; — 2d. The too frequent denial of its infectious character, and the proceeding upon that supposition; — and 3d. The neglect of measures based upon its infectious character and especially of the immediate separation of the infected, and the removal of them to the pestilential hospital, even when such removal could have been carried into effect.

67. The sending of a vessel to sea ought never to be enforced where the means of immediate separation of the sick and suspected, and of purification, can be carried out, in the place or port where the vessel lies; for by doing so, the infection of the whole susceptible persons in the crew, or among the passengers, is thereby ensured before she can possibly reach a temperature so low as to put a stop to its extension. In cases of ships of war or transports, the captain should be advised to proceed to the nearest port where these measures can be enforced, with all the precautions of quarantine, and without endangering the inhabitants of the port; and a recourse to a colder climate should not be entertained unless it may be certainly reached in a much shorter time. But the distemper may appear in vessels in such places and circumstances as preclude the possibility of reaching either a suitable port or a colder climate, within a period likely to save the crew, or at least a large proportion of them. In this dilemma, and even whilst the attempt to reach either of these destinations is being made, the resources of the medical officer, as well as of the captain, become of the greatest importance, and if wisely directed are always most advantageous.

68. In the circumstances now adverted to, every means of ventilation consistent with the safety of the ship should be enforced. The hatches and gun-ports ought to be constantly open, and wind sails carried down to the lower decks and hold. The infected should be removed instantly upon being attacked from among the crew, to a well-ventilated place upon the upper or gun-deck, and be excluded as much as possible from all persons but the unsusceptible or those who have been formerly attacked, and these latter should be made attendants on the sick. The sick berth should be separated by a bulkhead or partition, and be in the best ventilated part of the ship. A number of the crew of a ship in which I was a passenger many years ago, had been exposed to the infection of pestilential yellow fever; and as they were attacked I advised them to remain on deck under an awning, a free perflation of air existing around them. The accumulation of infectious emanations was thus prevented, and the distemper extended no further than to one only of the crew who was not exposed to infection in the first instance. The seclusion of the infected and ventilation should be rendered as perfect as possible; and all the evacuations ought to be instantly removed in covered vessels and immersed in the sea, without uncovering them until actually immersed. Various disinfecting agents, especially the solutions of the chlorides, the vapour of creasote, &c., may be employed, but they should never interfere with a recourse to every possible means of ventilation, to which they should always be subordinate in importance, as they are in efficacy.

69. II. PROTECTION OF INDIVIDUALS, FAMILIES, OR CLASSES, FROM A PREVAILING PESTILENCE. — When pestilence exists in a city or place, or when measures have not prevented the introduction of it, much may be accomplished by cautiously devised means either of avoiding it, or of enabling the frame to resist it. The most certain way of escape is, —

70. i. DEPARTURE FROM THE SPHERE OF INFECTION, OR STRICT SECLUSION OR QUARANTINE. — Departure from the infected city or place, is protective to all such as have not been exposed to the emanations from the sick, and from fomites previously to their departure. In the Levant, European consuls and merchants generally observe strict seclusion during the prevalence of plague, but the seclusion is enforced with great difficulty in respect both of persons and effects, more especially body-clothes, &c. Moreover, when seclusion is attempted in a house or mansion forming part of a street, or within the walls or limits of a town, the atmosphere around the place of seclusion may be so contaminated by the numbers of sick and dead, as to become more or less infectious to the inmates of the secluded residence; and the winds or currents of air may convey the infection into the very apartments of such residence. This circumstance fully explains the failure of seclusion in affording protection in the comparatively few instances in which seclusion has failed.

71. *A. In order, therefore, that protection may be with great certainty procured,* departure from an infected town or place should be immediate upon the ascertainment of the existence of pestilence, and before the pestilence has extended itself to many of the inhabitants; for, if it have spread far, or if cases of it have occurred in most of the quarters of a city, it is impossible to determine who is, or who is not, already infected, although not yet attacked, and the distemper may be conveyed to healthy localities in the persons or effects of those who may then depart. Indeed, this contingency has been often observed as regards each of the three pestilences in question. The same remark equally applies to seclusion or quarantine within or near an infected city or place; for, if the seclusion be too long delayed, some one of the persons about to be secluded may have been exposed to the infectious effluvium, and be attacked several days after this precaution has been adopted, and thus introduce the distemper among the secluded party. In this case, the further extension of the malady may be prevented by the immediate removal of the person attacked, with his personal effects, from the place of quarantine; but the removal should be effected, if possible, by non-susceptible persons.

72. Those who may be unable to depart from an infected place, or to seclude themselves, should carefully avoid a too near approach to any person either in a street or in a house, and more especially to those who are strangers. Above all, they ought to avoid the breath or the expired air from another person; and they should not enter the houses or apartments of any one unless there is the fullest evidence of immunity from infection. But even when no risk may be anticipated, persons or articles may be in these houses at the time which may endanger those who approach them. If any danger exist as regards the reception-rooms of a house; the danger is greater in respect of the sleeping apartments. Great caution should, also, be exercised as respects articles of clothing, beds, and bed-clothes. During seasons of pestilence, the linen of a family ought not to be sent out of the house; it should be cleaned at home; and care ought to be taken that this precaution extends to the servants more especially; and no beds, bedding, or clothes, more especially such as may have been previously used, ought to be admitted. Strangers, and particularly those with effects, ought to be excluded as much as possible, unless they come direct from healthy and uninfected places.

73. *B. Restrictions should be imposed on those departing from an infected locality,* in order that they may not convey the pestilence to the places of their destination, and that they may be received in these places in such a way as may least endanger the safety of the inhabitants. — *a.* Persons who appear to be already attacked, or those who have members of their families attacked, or who have recently lost any of their family, either should not depart for a healthy locality, unless the departure be to a country residence or house, secluded from other houses, or should be subjected to strict quarantine before being admitted into towns, cities, or ports.

74. *b.* All persons leaving infected places ought to obtain from the Medical Board, or Board of Health, which should exist in all cities and large towns, certificates of the probable degree of immunity from infection existing in their individual cases, to be produced to the authorities of the places to which they are about to proceed. The information supplied by persons requiring

these certificates may be verified by the messengers of the board.

75. *c.* Persons already infected, and suspected cases, instead of being allowed to depart for healthy towns, should be removed to quarantine, infected, or observation hospitals, according to the circumstances of each case; and not be permitted to endanger the inhabitants of an uninfected place until due precautions have been strictly enforced.

76. *d.* It is obvious that, if certain restrictions are requisite on persons departing from an infected place, they are still more necessary for those who arrive at an uninfected city or port; and more especially for those who come from an infected part. On these latter, a due period of observation and quarantine should be imposed, when the circumstances of the locality or town are such as admit of the restriction being duly enforced. The chief difficulty is the determination of the period of observation or quarantine in each of the pestilences in question. When persons have already passed some time from leaving an infected place before arriving at their destinations, a proportionate abridgment of the period of quarantine may be allowed, especially if no sources of infection existed at any place in their routes. In the case of a person arriving directly from an infected place not far distant, there is every reason to believe that a quarantine of fourteen days would afford sufficient protection, in respect of any of the pestilences now considered. But the clothes and personal effects of this person should be immediately opened up and ventilated.

77. *e.* In all cases, where the clothes, linen, and bedding are infected, or even suspected, disinfecting agents should be applied to them. Of all disinfectants, high ranges of temperature are the most efficacious; and the best method of employing a high temperature, with the view of decomposing the morbid effluvium retained by the bedding or clothes of persons who have labeured under pestilential and infectious maladies, is that invented by Mr. DAVISON and Mr. SYMINGTON, who recommend the transmission of heated air through a chamber in which these articles are suspended; the temperature of the air being raised to grades, varying from 200° to 250° of FAHRENHEIT. The great advantage of this method is its easy applicability to all kinds, and to any number, of objects and articles*, without injury to their textures or fabrics.

78. ii. PROTECTION BY SUCH MEANS AS MAY ENABLE THE CONSTITUTION TO RESIST INFECTION. — *A.* There are four facts which should be kept in recollection, as being intimately connected with the adoption of preservative measures against pestilence. — 1st. That a specific principle or effluvium, probably, of a parasitic or organic nature (PESTILENCE, SEPTIC, § 137.), proceeding from the diseased is necessary to the communication of the malady. 2d. That this specific effluvium is inhaled with the air into the lungs, when a person sick of either pestilence is too nearly approached; and that the infecting effluvium invades the susceptible frame chiefly through the respiratory passages and organs. 3d. That a pre-disposition to become affected by this effluvium is requisite to infection by it, or a susceptibility of infection. In what this susceptibility consists can hardly be determined with precision in many cases, and as respects each of the kinds of pestilence, although there is sufficient reason to believe that the causes of predisposition described above, with reference to each of these distempers, are more especially concerned in producing it: and 4th, as regards two of these maladies at least, a previous attack destroys this susceptibility. Upon these facts all prophylactic measures should chiefly be based.

79. As respects the first and second of these, the measures above recommended, in order to prevent exposure to infection, are the most efficient; the great object being to avoid intercourse with such persons as are most likely to have been among the infected, and a near approach to contaminated articles. The pre-disposing and concurring causes of the distemper, as far as they are known, ought to be avoided. There is much reason to believe that whatever tends, directly or indirectly, to exhaust the vital energy, especially excesses of every kind; low and unwholesome diet; exposure to cold, chills, wet, night-dew, &c.; the use of cold fluids, of cold, flatulent, and unripe fruits, will favour the invasion of pestilential infection. On the other hand, whatever supports the energy and preserves, in their due regularity, the several functions of the frame, will render the body less susceptible of infection.

80. If at any time exposure to the night-air or to cold and moisture is inevitable, the system should be fortified against them, but not, unless when better means are not within reach, by wines or spirits; for these should be used in very moderate quantity; otherwise they will leave the system, as soon as their stimulating effects have passed off, more predisposed than before to the invasion of the

* Messrs. DAVISON and SYMINGTON, civil engineers, have employed heated air, in various modes, both in currents and otherwise, and in various grades from 60° to 600°, and for numerous purposes, — for the drying and seasoning of timber, for the prevention of dry-rot, for the drying and preserving of animal and vegetable substances, for cleansing casks, and for preventing mouldiness, and the formation of fungi, and other parasitic productions; for disinfecting foul clothing, feather and wool beds, mattresses, &c.; and have obtained patents for the application of heated air to all these, and various other purposes. Their experiments prove that currents of heated air of 250° and upwards, may be passed through linen and cotton articles, for the purpose of disinfection, without injury to their textures, and that woollen and other animal productions, as feathers, feather-beds, wool-beds, hair-mattresses, cloths, flannels, &c., will not be injured by a temperature of 240°. It is obvious that the application of this method to the purification or disinfection of all kinds of bedding, and bed and body-clothes, used in hospitals, ships, prisons, &c., will be of the utmost advantage. Even to private families it will often prove most beneficial, especially in arresting the progress of infectious diseases, to transmit the contaminated beds, bed-clothes, &c., to a place where this mode of purification and disinfection is employed. On the occasion of small-pox, scarlet fever, typhus, or measles, having infected one or more members of a family, the infection being, possibly, limited to one chamber or floor of the house, and due precaution being taken so to limit it, the properly constructed, and carefully closed cart of the establishment might remove the contaminated articles to the place of disinfection, and return them in a very short time, thereby preventing the extension of the malady to the rest of the family, or to other persons by that medium which is most likely to transmit the infection. In these maladies, and still more remarkably in pestilential distempers, this method of disinfection deserves a general adoption, in respect both of its great efficiency, and of its universal applicability. When feather beds, or woollen and hair mattresses have become foul or impure, as they must necessarily become when in long use, especially in hospitals, prisons, ships, &c., this method of purification is particularly necessary. The beds used in lying-in-hospitals ought frequently to be subjected to this process, in order to prevent puerperal fevers and diseases.

infectious effluvium. Medicinal tonics, however, and those more especially which determine the circulation to the surface of the body, at the same time that they improve the tone of the digestive organs, and promote the regular functions of the bowels and biliary system, may be resorted to on such occasions. For this purpose the infusions or decoctions of bark, of cascarilla, of columba, &c. with the spirits of MINDERER, or any warm stomachic medicine; or the powdered bark, or the sulphate of quinine, or the balsams, may be taken either alone or with camphor, or with the aloes and myrrh pill, and any one of the spicy aromatics.

81. B. *Olive oil* has been much employed, both in Spanish America and in the Levant, not merely for the cure, but as a prophylactic, of pestilential distempers; in the former countries, with lime juice, in the hæmagastric pestilence; in the latter, both internally and externally for the plague. It is usually given in full and frequent doses in both distempers; and, from the information I have derived from various quarters, it appears to be deserving of a much more extensive trial in these pestilences, than it has hitherto received from European physicians. As a prophylactic it has usually been employed externally with slight friction, after coming out of the warm-bath. It is much employed in both hemispheres by the native practitioners of medicine.

82. C. *The diet* should be regular, moderate, nutritious, and easy of digestion. Whilst every approach to low living should be shunned, its opposite ought never to be indulged in. The stomach should have no more to do than what it can perfectly accomplish, without fatigue to itself, but to the promotion of its own energies. It must never be roused to a state of injurious excitement by means of palatable excitants, nor weakened by over-distension, or too copious draughts of cold relaxing diluents.

83. Care should be taken never to be exposed to the morning or night air, with an empty stomach. A cup of coffee previous to such exposures will be serviceable. The state of the bowels should be always attended to, and their functions regulated and carefully assisted; but in no case should this be attempted by cold, debilitating medicines, such as salts. The warm stomachic laxatives, or those combined with tonics, may be adopted with advantage as occasion may require.*

84. Particular attention ought to be paid to personal and domestic cleanliness. The surface of the body should be kept in its natural and perspirable state. The constant use of flannel nearest the skin will be serviceable for this purpose. Excessive perspirations ought to be avoided.

85. During the existence of either of the pestilential diseases in our vicinity, or family, these precautions are still more imperatively required. A free ventilation of every apartment ought to be constantly observed; in conjunction with fumigations, by means of aromatic substances kept slowly burning, or by the vapour of the chloride of soda or of lime. If a quantity of a very weak solution of the chloride of lime be put in a vessel, and some muriatic acid poured on it, and placed in the hall, or the very lowest parts in a house, the disengaged gas will soon find its way in suffcient quantity to the higher apartments.† The attendants on the sick should particularly observe the measures now prescribed, and ought never to bestow their attentions on the affected so near their persons, as to inhale the effluvium emanating from them, without at least fortifying the vital energies in the way pointed out; and they should carefully avoid entering upon those duties with an empty stomach, or when fatigued.

86. Besides burning warm aromatic substances, and odoriferous gum-resins, in the apartments, and in those adjoining them, in which affected persons are or have been confined, a saturated solution of camphor in aromatic vinegar, or in the pyroligneous acid, should be occasionally sprinkled on the floors, furniture, and bed-clothes. These means, with a thorough ventilation, and a due attention to cleanliness, will not only counteract the influence of the effluvium proceeding from the affected, and ward off its action even on the predisposed, but will also prevent the clothes, bedding, or furniture of the apartments of the sick from becoming imbued with it, so as to communicate the malady. They are within the reach nearly of all; and, in the event of the extension of pestilence to any considerable town or city, if care were taken to see them put in practice, under the direction of medical councils of health, one of which should be

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* Any of the following recipes may be employed for the purposes here recommended:—

No. 319. ℞ Decocti cinchonæ, ℥ivss; liq. ammon. acetat. ℥iss; spirit. ammon. arom. ℥ij; tinct. capsici annui, ♏xx; spirit. pimentæ, ℥ij. Misce. Fiat mist. cujus capiat coch. j vel ij vel iij pro re nata.

No. 320. ℞ Infusi Cascarillæ, ℥vjss; potassæ subcarbon. ʒj; tinct. aurantii comp. ʒiij; spirit. lavandul. comp. ʒjss. M. Fiat mist. cujus capiat cochlear. ij vel iij larga, mane nocteque.

No. 321. ℞ Quininæ sulphatis, ℈j; massæ pilulæ aloes et myrrhæ, ʒss; Extr. Anthemidis, ʒj. M. Fiant pilulæ xx. quarum sumatur una mane nocteque.

No. 322. ℞ Camphoræ rasæ, ℈j; extr. gentianæ; pilul. aloës cum myrrha, ãã ʒss; pulv. capsici, gr. xv. syrupi simp. q. s. M. Fiant pilulæ xxiv. quarum capiat binas mane nocteque.

No. 323. ℞ Camphoræ rasæ, ℈j; pilulæ galbani comp. ʒss; quininæ sulphatis, gr. xii; pulv. capsici annui, gr. xx; balsami Peruviensis, ℈j. Fiant pilulæ xxx. secundum artem, quarum capiat binas primo mane ac nocte.

Shortly before the sailing of the Niger Expedition, sent out by Government, a physician, one of the naturalists to the expedition, called upon me, he having heard that I had been in or near that part of Africa to which he was about to proceed. During our interview, I advised him to take three grains each of camphor, sulphate of quinine, and capsicum, night and morning during the period of his exposure to the malaria proceeding from the low grounds near the banks of the river, and to increase the dose to five grains of each when the exposure was greater than usual, or the malaria more concentrated. This gentleman called upon me upon the return of the expedition, to thank me for my advice, which he had followed, and he informed me that he had not experienced a single day's illness.

† Dilute one part of the concentrated solution of *the chloride of lime* with fifteen parts of cold water, and stir the mixture for a few minutes.

Place an open earthen vessel, containing a quart of the diluted solution, in the current of air entering the room or place to be disinfected, and pour into it a wine-glassful of the hydrochloric acid: perfect purification will very speedily take place. In about an hour fresh air should be admitted as freely as possible. If clothes supposed to be infected are suspended in the room during this process, they will be readily purified.

To disinfect rooms in which sick persons are confined (who would be incommoded by the above rapid mode of purification), wet a linen cloth with the diluted solution, and suspend it in the place to be disinfected: it will require renewal two or three times a day. Night-chairs, or any vessels in which putrid animal or vegetable matter has been kept, will be immediately disinfected by rinsing them with the diluted solution; a small quantity of which may afterwards be allowed to remain in them whilst in use.

To disinfect drains, sewers, and water-closets, a quantity of clean water should first be thrown down them, and afterwards one or two gallons of the above diluted solution.

formal in each district, or quarter, much good would result from them. Keeping in recollection the principle with which I set out, namely, that the exciting cause of the disease undoubtedly makes its first impression on the lungs, the advantages of those measures, from the circumstances of their being applied especially to this organ, must be obvious.

87. *D. The state of the mind* also requires judicious regulation. It ought never to be excited much above, nor lowered beneath its usual tenor. The imagination must not be allowed for a moment to dwell upon the painful considerations which pestilence is calculated to bring before the mind; and least of all ought the dread of it to be encouraged. There is a moral courage sometimes possessed by individuals who are the weakest perhaps as respects physical powers, enabling them to resist more efficiently the causes of infectious and epidemic diseases, than the bodily powers of the strongest, who are not endowed with this mental energy. Those who dread not attacks of diseases, and who yet exercise sufficient prudence in avoiding unnecessary exposure to their predisposing and exciting causes, may justly be considered as subject to comparatively little risk from them. This, I am persuaded, is particularly the case as respects the pestilential cholera, and I wish to impress it upon the minds of those whom the observation concerns. On all occasions a fool-hardy contempt or neglect of ailments, especially those affecting the stomach and bowels, ought to be guarded against, and the best medical advice be immediately procured upon the first manifestation of disorder.

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PHARYNGITIS. See Throat, Diseases of.

PHLEBITIS. See Veins, Inflammation of.

PHLEGMASIA ALBA DOLENS. — Synon.:

Phlegmasia Dolens, Hull; — *Phlegmasia Lactea*, Levret; — *Ecchymoma Lymphatica*, Parr; — *Anasarca Serosa*, Cullen; — *Ecphyma Œdematicum*, Young; — *Sparganosis puerperarum*, Good; — *Phlebitis cruralis*, Davis, Lee; — *Cruritis*, Hoesack; — *Œdema Lacteum*, *Metastasis Lactis*, Auct. Var.; — *Œdème des Nouvelles Accouchées*, *Dépôt laiteux*, Fr.; — *Milchstreichen*, Germ.; — *Crural Phlebitis, swelled leg of Lying-in Women*; — *Puerperal tumid leg.*

Classif.: — III. Class, I. Order (*Author*).

Defin. — i. Nosolog. Defin. — *Painful and tense swelling of one or both legs, attended by fever, and running an acute and definite course, occurring most frequently after delivery.*

2. ii. Patholog. Defin. — *Inflammation or obstruction, or both, of the veins, lymphatics, and lymphatic glands, sometimes attended by inflammation of the adjoining nerves, most frequently occurring after delivery; but sometimes appearing independently of the puerperal states, and consecutively of other diseases, mechanically or otherwise implicating the veins, absorbents, and nerves of a limb.*

3. Having sometimes met with this disease in various circumstances as the sequela of other maladies, independently of the puerperal states, I have not considered it under the head of Puerperal Diseases. Whether occurring after delivery, or in other circumstances, it evidently does not present the same appearances and symptoms, in all instances; and in fatal cases the morbid changes are also not always the same. Owing to these causes, opinions have lately differed widely as to its nature, and to these opinions I shall more particularly refer.

4. I. History. — This affection was first noticed by Roderic a Castro and Wiseman; but Mauriceau first described its symptoms, and referred them to pathological states. He appears to refer many of the symptoms to the femoral nerve; but Dr. Lee supposes him to have mistaken the femoral vein for the nerve. Puzos and Levret subsequently described the disease, and considered it to proceed from metastasis of the secretion of milk. The former states that it is a painful and sometimes fatal malady, occurring frequently about the twelfth day after delivery, although sometimes as late as the sixth week. The description of Levret coincides with that of Puzos, and both refer the disease to the crural vessels; especially in their accounts of the symptoms, although they view it as proceeding from a "depôt de lait." According to Mr. Cruickshanks, Dr. William Hunter did not subscribe to the opinion of Puzos, and did not view it either as a metastasis of the milk, or as a cold of the limb, as it was considered by some. Mr. Trye published, in 1782, an essay on the disease, in which he referred the symptoms to rupture of the lymphatics as they cross the brim of the pelvis under Pou-

part's ligament. Mr. White soon afterwards published on this affection, and suggested the opinion that it depends on obstruction, detention, and accumulation of lymph in the limb, or some other morbid condition of the lymphatic glands and vessels of the part. Mr. White saw fourteen cases, but they all recovered. Dr. Ferriar next maintained that the disease proceeded from inflammation of the absorbents. In 1800, Dr. Hull published an essay on phlegmasia dolens, in which he showed that all the phenomena could not be explained by referring them to inflammation of the lymphatics only; he therefore viewed them as the results of an inflammatory state of all the textures of the limb — of bloodvessels, lymphatics, glands, nerves, cellular and muscular tissues, causing an effusion of serum and coagulating lymph; but he furnished no case in which the appearances observed on dissection supported this view.

5. It is a remarkable circumstance, as Dr. R. Lee has remarked, that nearly a century and a half should have elapsed since the time when this disease was pointed out by Mauriceau, before the precise nature of it was attempted to be ascertained by dissection. There had been opportunities to determine the accuracy of the different opinions advanced as to its nature and origin, but these were neglected until 1817, when Dr. Davis examined the body of a patient who died of it; and the appearances were described by Mr. Lawrence. The left lower extremity was œdematous, without external discoloration from the hip to the foot, owing to effusion into the cellular tissue. The inguinal glands were a little enlarged, but pale coloured. The femoral vein, from the ham upwards, the external iliac, and the common iliac veins, as far as the junction of the latter with the corresponding trunk of the right side, were distended and firmly plugged with what appeared externally, a coagulum of blood. The femoral portion of the vein, slightly thickened, and of a deep red colour, was filled with a firm bloody coagulum, adhering to the sides of the tube, so that it could not be drawn out. As the red colour of the vein might have been caused by the red clot every where in contact with the vein, it cannot be deemed a proof of inflammation. The trunk of the vena profunda was distended in the same way as the femoral vein; but the saphæna and its branches were empty and healthy. The substance filling the external iliac and common iliac portions of the vein was like the laminated coagulum of an aneurismal sac. The tube was completely obstructed by this matter, more intimately connected to its surface than in the femoral vein; adhering, indeed, as firmly as the coagulum does to any part of an old aneurismal sac; but in its centre there was a cavity containing about a tea-spoonful of a thick fluid of the consistence of pus, of a lightish-brown tint, and pultaceous appearance. "The uterus, which had contracted to the usual degree, at such a distance of time from delivery, its appendages and blood-vessels, and the vagina, were in a perfectly natural state. There was not the least appearance of vascular congestion about the organ; nor the slightest distension of any of its vessels. Its whole substance was pale, and the vessels every where contracted and empty." (*Transact. of Med. and Chirurg. Society*, vol. xii, p. 427.)

6. An essay was read by Dr. Davis, on the 6th of May, 1823, to the Medical and Chirurgical Society, with the object of proving that the proximate cause of the disease, called phlegmasia dolens, is an inflammation of one or more of the principal veins within, and in the immediate vicinity of the pelvis, producing an increased thickness of their coats, the formation of false membranes on their internal surface, a gradual coagulation of their contents, and occasionally a destructive suppuration of their whole texture; in consequence of which the canals of these vessels are so much diminished, or so totally obstructed, as to be incompetent to the circulation of blood through them. He first notices a case by J. G. Zinn (*Comment. Soc. Reg. Götting.* t. ii. p. 364. 1753), in which dissection disclosed an enlarged and indurated state of the inguinal glands of the affected limb, surrounding the crural vein, and diminishing the diameter of this vessel; and next adduces the case, the post mortem appearances of which I have noticed as described by Mr. Lawrence; and, in addition to the cases which he had himself observed, he mentions a case communicated to him by Mr. Oldknow, in which inflammation of the iliac veins was present; and "the absorbent vessels and glands were slightly enlarged as high as the lumbar regions, but not otherwise affected." (p. 436.)

7. During the commencement of 1823, M. Bouillaud published several cases and dissections, in which the crural veins were obliterated in women who had been affected with swelling of the lower extremities after delivery; but Dr. Davis had been promulgating his views since the occurrence of his first case in 1817. Dr. Bouillaud distinctly states, in his instructive memoir on this subject, that he considers obstruction of the crural veins to be the cause not only of the œdema of lying-in women, but of many partial dropsies; and he adduces instances of this obstruction being caused both by disease of the vessel itself, and by tumours pressing upon the vessel. (*Archives Générales de Medicine*, t. ii. 1823.)

8. Soon afterwards, M. Velpeau published some observations on this disease, and concluded as follows: — 1st, The acute swelling of abdominal extremities of women after delivery has for its cause, at least in some cases, inflammation of the pelvic articulations, or of the veins. 2d, On the other hand, the symptoms observed in the living patients are referable as much to severe lesion of the deep-seated veins, as to that of the lymphatics. 3d, At present it remains to be shown, whether or not these latter parts are really the cause of the phlegmasia alba dolens. 4th, Affections altogether different are ranged under the same name, causing confusion, and giving rise to obscurity in the writings of several physicians on the subject. Those cases adduced by M. Velpeau, and which occurred in the Parisian hospitals, are very interesting. In all of them there were marks of inflammation, with collections of pus, in the pelvic articulations or symphyses, in the uterine canals and veins (see case 2d), in the iliac and femoral veins, and in the lymphatics and glands. The whole of the memoir, and the observations appended to it by M. Andral, have not received, from more recent writers on the subject, the attention which they deserve. It should be added, that M. Velpeau considers the inflammatory appearances, and the purulent matters found in the veins and lymphatics, to be the consequences of the inflammation commenced in the pelvic articulations

and uterine organs. (*Archives Génér. de Méd.*, t. vi. p. 220.)

9. MM. GARDIEN and CAPURON, somewhat earlier writers than those now referred to, regarded the disease as an inflammation of the lymphatic vessels and glands; and Dr. DEWEES considered it to be inflammation occupying "exclusively the white lymphatic vessels (?) of the cellular membrane of the several textures of the limb." (*Dis. of Women*, p. 489.)

10. Dr. BURNS believed, and with much justice, judging from some cases which I have seen, "the nerves to be implicated in the disease as much as the veins; and that whilst both may contribute, we shall find, in different cases, one or other predominate. (*Midwifery*, p. 611.)

11. In April, 1824, I attended a case, with my friend Dr. DAVIES, now of Hertford, in which the symptoms indicated at the commencement considerable affection of the nerves of the limb; but those of vascular obstruction afterwards predominated. (*Lond. Med. Repository*, vol. xxiii. p. 452.)

12. Dr. DAVIS, to whom the honour of originating the phlebitic pathology of phlegmasia dolens belongs, considered the inflammation to commence in the iliac veins. But Dr. LEE remarks, that Mr. GUTHRIE suggested to him the idea of tracing the affected veins to their origin in the uterus; and that, acting upon this suggestion, he ascertained that crural phlebitis is but an extension of uterine phlebitis. That the disease thus originates, in many cases, cannot be doubted. I have myself seen such cases, and Dr. LEE has observed many others. One of my cases, not however occurring in the puerperal state, was seen also by him. But, judging from the few I have seen, and from the descriptions of cases which have been published, I cannot come to the conclusions, either that the affection is a pure and uncomplicated phlebitis in all cases, although it may be in some, or that it always originates in the uterus, although it often does so originate. My views as to the pathology of this affection will appear more precisely in the sequel.

13. II. DESCRIPTION.—This disease attacks much more frequently the left lower extremity than the right. It very rarely commences in both limbs at the same time; but it sometimes passes over to the other limb, when it leaves the one first attacked. It generally appears within six weeks from delivery,—most frequently between the fourth and fifteenth day; but it is not confined to the puerperal state. Dr. LEE states, that in eight of twenty-three cases of puerperal crural phlebitis seen by him, the disease commenced between the fourth and twelfth day after delivery, and in the remaining fifteen, it appeared subsequently to the latter of these days.

14. i. SYMPTOMS. — The pathognomonic symptoms of phlegmasia dolens are preceded, in some cases, by general febrile disturbance, and in others the local symptoms are the first to appear. In the former case the patient complains, from the period of delivery, of fever which continues without a manifest cause; and, in the course of a few days, the swelling of the limb appears. In other instances, the swelling is preceded by severe rigors, which recur several times. In many cases, signs of peritonitis, or of inflammatory action of the pelvic viscera or parietes, are present before the symptoms of this affection are remarked, especially in the same side of the pelvis with the affected limb; and there is often a severe pain complained of in the iliac fossa of that side. In a few cases, however, the symptoms of phlegmasia alba dolens occur suddenly in one of the limbs, without pain or any other symptom in the abdomen or correspondent iliac region. In addition to uneasiness and pain in the lower part of the abdomen, or extending along the brim of the pelvis, the patient is weak, irritable, and depressed.

15. *a*. When the disease begins in the pelvis, the *pain* soon extends below POUPART's ligament along the thigh to the ham, calf of the leg, and instep of the foot. Shortly afterwards, the inguinal region is tumified and tense—and, in a day or two, the thigh becomes swollen, tense, white, and shining. When the pain commences in the calf of the leg, the swelling is first observed there, or at the ancles, gradually extending itself up the leg and thigh. In some cases, the pain ascends from the leg along the thigh to the groin, or even to the iliac region. In rarer instances a considerable space intervenes between the situation of the pain, which, in this case, is usually felt in the inguinal region and in the leg, the thigh being exempt from pain.

16. The *character* of the pain varies greatly. In some it is merely a sense of numbness or stiffness, or a sort of cramp, or a painful feeling of tension. In others, the pain is severe, burning, or shooting; and in several it is darting or lancinating, and so violent as to cause the patient to scream aloud. The slighter or duller pains are usually constant, but the violent shooting pains are remitting. The pains follow exactly the course of the femoral vessels, the darting violent pain being especially referable to the femoral nerve. In some cases, the pain extends all the way from the iliac fossa along the thigh to the ham and calf of the leg. The whole surface of the limb is tender. Pressure at any part, but especially on the femoral vessels, and nerves, remarkably aggravates the pain. The least motion of the extremity, more especially extension, greatly increases the pain; the easiest position is that of partial flexion. Aggravation of the pain on pressure is sometimes only felt in a limited portion or spot, as in the groin, or popliteal space, or calf of the leg.

17. *b*. The *swelling* generally occurs after the pain has existed a short time—usually after a period varying from twelve to thirty-six hours. In some instances, the swelling appears nearly contemporaneously with the pain; and it usually commences in the same situation as that in which the pain is at first felt. In the majority of cases, it proceeds from above downwards, implicating successively the hip, nates, and labium pudendæ; the thigh and leg. CASPER, CALLISEN, FRASER, and RAIGE-DELORME mention instances in which the swelling extended also upwards to the flank and trunk, so as to reach the upper extremity of the same side. In some cases it begins in the foot, and rises more or less rapidly until it invades the whole extremity, the nates, vulva, and iliac region; but PUZOS, LEVRET, WHITE, GARDIEN, and other writers consider the descending character of the swelling as pathognomonic of the disease. The swelling is sometimes so great, that the affected limb is double the healthy size. When it

is advanced it is generally uniform, but it is sometimes more remarkable on the inside of the thigh, and near the knee. In the early stage of the disease, and whilst the acute symptoms continue, the swelling is tense, and does not pit after pressure; it is generally at a later period that pitting from pressure is observed.

18. *c.* The *colour* of the limb is commonly a pearly white. In some, reddish lines are observed chiefly in the course of the vessels; and in others, only small red spots or points. In cases observed by Dr. LEE and M. SALOUES, dark vesicles and phlyctenæ were observed; and in a case terminating in gangrene, under the care of Dr. DAVIES, and also seen by me, the usual discoloration of the skin in such circumstances was observed. In most instances the *temperature* of the affected limb is increased, especially on the inner aspect, and at the earlier periods; but sometimes, as Dr. BOURNE has remarked, it is diminished, particularly at an advanced stage. Gangrene, in the case just adverted to, was preceded for several days by great coldness of the limb. Most writers have remarked the existence of a *nodulated chord*, very painful on pressure, descending from the crural arch more or less down the thigh. This chord may be only barely perceptible, or very remarkable, from the thickening and infiltration of the cellular tissue surrounding the vessels. In some cases, it descends considerably down the thigh, and may even be detected in the popliteal space. It is not easily detected when the swelling and pain are great, and it is chiefly when the more violent symptoms have subsided that it can be best ascertained. The pain and tenderness are always greatest in the course of this chord, or in its immediate vicinity.

19. *d.* Enlargement of the *glands* in the groin, and even of those of the ham, is often observed during life, and found after death. In some cases, as observed by CASPER, red lines are traced along the surface in the direction of the tumified and tender glands. The nodosities frequently found in the course of the vessels are attributable, in some situations and cases, to enlargement of the glands; and, in other places and instances, to the induration and inflammation of portions of the cellular tissue surrounding the inflamed vessels; or to thickening of the coats of the vessels, and to coagulation of the blood below the seat of obstruction. As observed, also, in the first case, in which a dissection was made after death, the tumours may arise both from enlarged lymphatic glands, and from the distension of the vein below the seat either of compression by these glands, or of obstruction by disease of the vessel itself.

20. *e.* The *constitutional symptoms* are often very remarkable, even before the local mischief is much complained of. In most cases, weakness, depression, irritability of the pulse, diminished or disordered lochia, diminution of the secretion of milk, want of sleep, and disorder of the digestive and excreting functions immediately precede and accompany the accession of the local disease. As this becomes developed, the pulse, hitherto weak, quick, or sharp, becomes rapid, often 130 or 140 in a minute, and small and feeble; the appetite is lost, the tongue is white or loaded, the thirst is increased; the bowels are confined, and the stools unhealthy, but they are sometimes loose, fetid, or bilious; the urine is turbid, and the lochia is often diminished or suppressed, or offensive. The patient is restless, sleepless, and irritable, or morbidly sensible. The countenance is generally pale, and sometimes evincing marked anæmia. There are frequently indications of disorder of the uterine organs, or of disease of the pelvic viscera or parietes. The vulva and vagina are tender; and pressure above the pubis is seldom made without pain. The os uteri is sometimes partially open and soft. At the commencement of the disease, the skin is generally hot and dry; but it sometimes becomes moist, or perspirations break out. The secretion of milk is often altogether suppressed or much diminished. In very severe cases, the febrile disturbance is not only attended by sleeplessness, but followed by delirium. In some instances, in which the disease supervened in the other limb, as it subsided in the first affected, the cerebral symptoms were very urgent. In two cases which were under my care, one of which was attended also by Dr. LEE, constant low delirium, followed by coma, came on; but the patient ultimately recovered.

21. ii. TERMINATIONS. — The disease may terminate variously: — 1st, *by resolution*. When it terminates in this way, the *acute symptoms* subside in the course of from twelve to twenty days, generally in the order of their appearance; the pain ceases, the swelling disappears, and the use of the limb returns. As the swelling begins to subside, it pits more readily on pressure; and, in many cases, the tumours and chord, in the situations already mentioned, are more distinctly felt, and in some the superficial veins are dilated, or irregularly enlarged, not only in the limb, but also, as stated by M. RAIGE-DELORME, in the flank and parts adjoining. As the resolution proceeds, the constitutional symptoms subside. Resolution takes place much more gradually and slowly when obstruction of the femoral is present. The swelling then continues sometimes for months, in a less degree, and thus becomes *chronic*, the patient being hardly able to use the limb. In these cases, thickening of the cellular tissue surrounding the vessel often exists, and a varicose state of the veins takes place and remains. — 2d, *Suppuration*, according to PETIT, CAPURON, and CHURCHILL, takes place in rare instances, generally in the tract of the large vessels, or situation of the lymphatic glands. — This result obviously proceeds from the inflammation of those vessels having extended to the surrounding cellular tissue and passed on to abscess. — 3d, The disease still more rarely terminates in *gangrene*. M. GERHARD has adduced a case in which this occurred; and Dr. DAVIES has published the details of another, which was also seen by me on several occasions. In this case, gangrene of the leg and foot was followed by sloughing, and the parts were amputated by Dr. DAVIES above the knee, the thigh being at the time about double the thickness of the opposite one. As soon as the vessels were divided, the blood in the veins was observed quite coagulated. A considerable quantity of serum was discharged from the surface of the stump, as soon as the leg was removed. (*London Med. Repos.*, vol. xxiii. p. 454.)

22. 4th, *Death* sometimes takes place, generally owing to the severity of the several changes which supervene in the course of the disease. It may occur suddenly, as remarked by DENMAN,

BURNS, and BLUNDELL, owing chiefly to exhaustion consequent upon previous losses of blood, and upon the violence of the constitutional and nervous symptoms, especially if the patient makes any exertion in this state, or raises herself up too quickly in bed. It most commonly, however, takes place, consequently upon the organic lesions found in the pelvic viscera and parietes, such as inflammation and purulent formations in the uterus, ovaria, and pelvic articulations, with similar changes and coagulations of blood in the iliac veins. In these cases, death is the result of contamination of the circulating fluids, and is generally preceded by a very rapid, small, and feeble pulse, by distressing feelings of sinking, by delirium, sometimes coma, and various nervous phenomena.

23. iii. APPEARANCES AFTER DEATH. On dissection, the limb is seen infiltrated with serum and lymph. Several small abscesses are disseminated through the cellular tissue, between the muscles, or one or two considerable abscesses are formed in the vicinity of the large vessels, especially in the iliac, inguinal, and popliteal regions. The sub-peritoneal cellular tissue, particularly that of the meso-rectum and iliac fossæ, is sometimes infiltrated with a sero-purulent matter. The articulations of the affected limb, and even the joints at a distance from the seat of the affection, although much more rarely, are occasionally the seats of suppuration. Purulent collections have also been found in the liver and lungs. A sero-puriform effusion has sometimes taken place in the pelvic cavity, and in the cavity of the pleura. These lesions are secondary, and the consequences of the phlebitis, constituting the chief pathological condition of the malady.

24. *A.* The researches of Dr. DAVIS, Dr. R. LEE, Dr. DAVIES, and others, have fully shown the great extent to which the *veins* of the limb, and very frequently also those of the uterus, are affected in this malady. The femoral vein is always more or less diseased. It is inflamed, its parietes are thickened, and its canal is obstructed by fibrinous coagula, in the centres of which puriform, or a brownish grumous, matter is often found. In rarer cases, a fibrinous false membrane is observed adhering to the interior of the vessel. The same changes may be traced along the profunda and popliteal vein, to most of the veins of the extremity. The phlebitis may be so general in the limb, that a puriform matter escapes from all the small veins upon dividing them. In many cases, however, the saphena remains unaffected. The same lesions as exist in the femoral vein are also generally observed in the external iliac of the same side, and often extend to the hypogastric or internal iliac. In this latter case, the veins of the vagina, of the neck and body of the uterus and of the ovaria and tubes; and, indeed, most of the branches which contribute to the hypogastric, present the usual appearances of inflammation, on the same side with that affected. In many cases, the same lesions are found in the veins of both sides of the uterine organs, but they extend not so far as the internal iliac of the unaffected side. In some instances the inflammation extends not only to the common iliac, but also to the vena cava, and in rare instances as far as the emulgent veins. M. RAIGE-DELORME remarks, that the alteration may even be traced to the right side of the heart; but this can be possible only in rare instances.

25. When the disease has existed in both extremities, the phlebitis in the pelvic and uterine organs extends along both hypogastric veins to the external iliacs and femoral veins, &c.; it has even been observed in the lower portion of the vena cava. It has been supposed that the supervention of the disease in the other limb, as that in the first attacked subsides, is produced by the extension of the inflammation from the common iliac of the one side, to the vena cava, and to the common iliac of the other side; but the inflammation of the uterine veins may extend to both limbs, although not at the same time, without passing to and from the vena cava. — M. RAIGE-DELORME refers to two cases in which phlebitis supervened in the brachial, cephalic, and cubital veins in the course of this disease.

26. *B.* The *lymphatic glands* and *vessels* are frequently also found inflamed; but where this lesion co-exists with phlebitis, it is difficult to determine which of the two is primary. They are probably contemporaneous in their development and course. In the account of the first *post mortem* examination of the disease on record, ZINN states, that the *inguinal glands* were greatly enlarged and indurated, and that they surrounded and very much diminished the diameter of the crural vein. The glands of the groin and ham are often enlarged, injected, and sometimes in a state of suppuration; but purulent matter is more frequently found in the cellular tissue surrounding them, than in the glands themselves. RAIGE-DELORME states that the glands in the iliac fossæ sometimes present various degrees of inflammation, which has also extended to the mesenteric glands.

27. *C.* The *lymphatic vessels* have been frequently overlooked in dissections of the affected limb. BOUILLAUD states that inflammation of these vessels has been ascertained in a considerable number of cases of this disease. MM. TONNELLÉ, DUPLAY, NONAT have also confirmed this view. M. ALBONNEAU (*Journ. Comp. du Dict. des Scien. Med.* t. xxxviii. p. 10.) has recorded a case in which "the superficial lymphatics of the thigh presented a deep red colour, were enlarged and tortuous, the veins being also inflamed on the same side as high as the vena cava." Dr. CHURCHILL remarks, that pus and evidences of inflammation are sometimes met with in the absorbents.

28. *D.* The *nerves* are probably also more frequently implicated than they have lately been supposed to be, particularly since attention was more especially directed to the veins. In the interesting case published by Dr. DAVIES, the symptoms, which were very violent in their accession, were referable to the femoral nerve; and M. DUCKS has adduced several cases, showing that neuritis actually forms a part of the lesions observed in this disease.

29. *E.* Alterations of the *uterus*, and especially of the *veins of the organ*, have been much insisted upon by Dr. LEE as the points of departure in the succession of morbid phenomena constituting this complex malady. Although M. VELPEAU appears to have been amongst the first to describe lesions of the uterus and its veins, in examinations of this disease after death, still Dr. LEE first insisted upon

the connection, and upon the circumstance of the phlebitis being propagated from the uterus or its appendages to the hypogastric, iliac, and femoral veins. Inflammation of the veins and canals of the uterus, puriform matter in them, or in the walls of the uterus; softening of the organ; membranous exudations on its internal surface; softening, dark discoloration and marks of inflammatory action, more especially at the part where the placenta was attached; puriform collections in the ovaria, &c., have been very frequently observed. Dr. BURNS, however, remarks that the uterus is sometimes found quite healthy. Besides these lesions, M. VELPEAU has shown that the adjoining pelvic viscera may be also more or less implicated, especially the sacro-iliac and pubic symphyses, the cartilages and ligaments of which are loosened, softened, and bathed in pus; but these lesions are not so frequent as those of the uterus and its appendages.

30. II. CAUSES.—*A.* This disease has not been observed with due precision in respect of its remote causes, and particularly as to those which *predispose* to the origination and extension of the several lesions recognisable during life and found after death. The much more frequent occurrence of the affection during the six weeks immediately following parturition evidently proves that the changes more especially connected with that period, are more or less concerned in producing it. The pressure which the gravid uterus exerts upon the nerves, bloodvessels, and other parts within the pelvis during the latter months of pregnancy, the violence which these parts often sustain during parturition, the sudden removal of the pressure, and the changes in the state of nervous function and of circulation consequent on the removal, altogether remarkably predispose to the supervention of the affection, especially when aided by other circumstances. But the disease may occur during pregnancy. PUZOS treated three cases before the period of parturition; and in these, as well as in others met with at this period, it is reasonable to infer, that the pressure was chiefly concerned in producing it in these instances, and that uterine phlebitis was not its point of departure.

31. As far as my own observation enables me to judge, aided by the histories of many recorded cases, constitutional debility and delicacy of frame; the exhaustion consequent upon protracted, difficult, or instrumental labours; hæmorrhage during or after parturition; and anæmial and cachectic states of the system, are amongst the most influential predisposing causes of this affection. Females subject to leucorrhœa, especially during pregnancy, appear also to be more liable than others to an attack.

32. *B.* The *exciting causes* are, in the great majority of instances, those of uterine phlebitis. The use of instruments during labour, injury of the organ, the retention of portions of the placenta, the means taken to remove it; the retention of coagula, or of the lochial discharge in the uterine cavity or vagina, owing to deficient contractile power; imperfect contraction of the uterine canals and veins admitting of the retention, and consequent alteration, of their contents; the passage of the retained and altered lochia from the cavity of the uterus into the uterine veins; inflammation of, and purulent collections in, the parietes of the uterus or in the ovaria, giving rise to inflammation of the veins of these organs; inflammation of the vagina, or of any of the pelvic articulations, are the most frequent exciting causes of phlegmasia dolens. These local conditions and changes, in the great majority of cases in which they take place, either proceed no further, or give rise to other secondary maladies than this; but, when the predisposition is marked, and when other causes reinforce these, the affection will be induced; and may occur, although in rare cases, even when the uterine lesions are not present.

33. There can be no doubt that, when the lochial discharge is not freely thrown off, in weak or exhausted females, or after copious losses of blood, and when morbid secretions form in the uterus or ovaria, in these states of the system absorption of these matters, either by the lymphatics or veins, or by both, will then take place more readily and abundantly than in other circumstances; the matters thus absorbed inflaming the vessels and contaminating the fluids. Causes producing a suppression of the lochia, or of the secretion of milk, may also occasion the supervention of crural phlebitis, and even of inflammation of the absorbents, by favouring the absorption of excrementitial matters; and thus the old doctrine of the metastasis of these secretions, although not strictly applicable to these cases, is not, in some respects, very wide of the truth.

34. Exposures to cold, wet, and to currents of air, insufficient clothing, and unwholesome, heating food and beverages, especially spirituous liquors, are evidently concurring, if not exciting causes. Probably more importance has sometimes been attached to the influence of cold than it deserves; but where the cold is applied directly to the limb — where the lower extremities are insufficiently protected from it, or where the patient wears damp shoes, &c., particularly upon getting about soon after parturition, the injurious influence may not be local only, but extended to several of the excreting functions; and, although it may not be sufficient of itself to produce the disease, it may powerfully aid the operation of other causes, or favour the extension of morbid changes existing in the uterine organs, or parts in the vicinity, to the iliac and femoral veins, or also to the nerves and absorbent vessels.

35. III. PHLEGMASIA ALBA DOLENS, UNCONNECTED WITH THE PUERPERAL STATES. — An affection, or rather a complex disease, in every respect similar to that now described in connection with the puerperal states, may occur in *women independently of these states*, and even in the *male sex;* but in every instance which I have seen of this description, amounting in all to nine, of which I have taken notes, it has been contingent upon some other dangerous disease; and has presented the same changes of structure in the limb as those which I have described above (§§ 24. *et seq.*). The diseases upon which it has supervened in my practice are the following:—Inflammation of the uterus; hysteritis complicated with dysentery; cancer of the mamma (two cases); tubercular consumption; typhoid fever; iliac abscess (two cases); malignant ulceration of the mouth and neck of the uterus, and injury of one of the upper extremities. The injury in this last instance of the affection was soon followed by inflammation of the lymphatics and veins; the patient, however, recovered.

36. The case of the disease following hysteritis occurred in 1831, in a lady who had not been pregnant for three or four years. The affection commenced in the right thigh, and extended to the left as it began to subside in the right. The patient had shortly before experienced a smart dysenteric attack, which was followed by inflammation of the uterus, and for each of these she had been moderately blooded. The disease of the extremities was most severe, and was attended by dangerous constitutional symptoms. As the case well illustrated Dr. R. LEE's views of the pathology of the disease, I requested him to see her. Delirium, sopor, and great nervous exhaustion supervened, but followed the very rapid subsidence of the swelling of both extremities, which had reached as high as the flanks. She was very remarkably benefited by nervous and restorative remedies, and recovered very rapidly. I have seen her very frequently since, and as recently as the day of my writing this; but there was never any evidence of enlarged veins or swelling about the ancles subsequent to the attack; the appearances of the limbs, up to this time, now fifteen years, being in every respect the same as before.

37. In the other case there were both hysteritis and dysentery; indeed, the whole pelvic viscera appeared simultaneously attacked. This person, the wife of a publican, had never been pregnant; only one extremity was affected; but low fever, with muttering delirium, coma, and destructive inflammation of one eye, supervened, and she died; the other eye also becoming affected shortly before death.

38. In both the cases of carcinoma mammæ, the arm on the affected side was enormously swollen, painful, and tender; but not discoloured. One of the cases was that of a lady attended by Dr. YOUNG and myself. She was only thirty-five years of age; had borne several children, and was then pregnant. Great enlargement of the lymphatic glands had taken place; and obstruction both of the lymphatic and of the venous circulation obviously existed. This lady, who was far advanced in pregnancy when the affection of the arm supervened, was delivered nearly at her full time of a child about one fourth the usual weight; she died, as was expected, shortly afterwards. The other case occurred in a person advanced in age, and was in all respects similar as regarded the local disease. In neither instances was an examination after death allowed.

39. The case contingent upon tubercular consumption, of which I have notes, and which was a remarkable instance of the affection, presented, upon dissection, tubercular deposits in the inguinal glands with great enlargement; obstruction of, and coagulation of blood in the femoral and iliac veins, the centres of the coagula consisting of a grumous, soft, or pultaceous brown matter. There had been, also, diarrhœa and ulceration of the bowels; but the veins were not traced from the iliac to the ramifications to the pelvic viscera; and it was hence not manifest whether or not the disease of the veins was caused by ulceration in the lower bowels, or by the morbid state of the blood consequent upon the absorption of purulent and tubercular matters. I have seen other cases of great swelling of one or both lower extremities, consequent upon phthisis; but I have had an opportunity of examining after death only the one now mentioned. My recollections of the others are such as to lead me to infer that the obstruction in the veins of the lower extremities was the consequence chiefly of the morbid states of the blood, aided by the physical conditions of the limb — the sitting posture, and the remora of the blood in the veins, owing to this posture, and to the influence of gravitation; and that these states favoured coagulation of blood in the veins, or inflammation of their internal surface.

40. Instances of phlebitis in the course of low or typhoid fevers are not rare. I have, however, met with only one in my own practice. In this case, there was certainly no evidence of ulceration of the lower bowels. The disease of the veins is to be referred chiefly to the state of the blood, and to some local physical conditions, or causes acting locally. Drs. GRAVES and STOKES have related instances of this contingent form of the affection. They remarked that the œdema was unattended by redness, but accompanied with pain, tenderness, increased heat, and impaired motion of the limb.

41. The first case of the disease contingent upon iliac abscess occurred to me in 1821, in a groom, a patient of the South London Dispensary, when physician to that institution, and was attributed to the pressure of the collected matter upon the iliac nerves and veins, and probably, also, upon the lymphatics. A more recent case was entirely similar, and both terminated fatally soon afterwards, but inspections were not permitted. There can be no doubt of the occasional occurrence of this malady during organic changes in the uterus and ovaria, occurring independently of parturition, and more especially if these changes are attended by the absorption of morbid secretions from these organs. D. R. LEE has adduced several instances of this source of the disease. Sir H. HALFORD has recorded two cases, which consisted chiefly of inflammation of the veins arising apparently from exposure to currents of cold air; and, in one case, from such exposure being in the standing posture. Many years ago I met with a case which originated in this cause; but the patient was of a cachectic habit of body; recovery, however, took place without any unfavourable occurrence. It is not improbable that, during an impure or morbid state of the blood, connected with debility and a languid state of the circulation, the remora of the blood in the veins of the lower extremities, favoured by position or other physical causes, will occasion either partial spontaneous coagulation, or an inflammatory state of the coats of the vessel; more especially if pressure have existed on the trunk of the veins. Hence the occasional appearance of this affection in the advanced progress of many other diseases, especially of those in the course of which morbid secretions are apt to pass into the circulation, or to be absorbed by the lymphatics; and when pressure has existed upon, or has been suddenly removed from, large veins. (VEINS, DISEASES OF.)

42. IV. NATURE OF THE DISEASE. — *A.* I have already noticed (§§ 4. *et seq.*) some of the opinions formerly entertained respecting the nature of this complex affection, and stated enough to show that most of these were more or less erroneous, but chiefly in their limitation to one only of the several

morbid conditions generally present in the fully developed cases of the disease. Since the days of WHITE, who attributed the malady to rupture of the lymphatics, most writers up to the end of the last century believed it to be an inflammation of the lymphatics. BOYER, TRYE, DENMAN, FERRIAR, and GARDIEN adopted this opinion, with certain shades of difference. Thus TRYE considered, that the inflammation of these vessels proceeded sometimes from pressure of the gravid uterus, sometimes from an acrid matter secreted by this organ; whilst DENMAN supposed that it originated in the lymphatic glands of the groin; and FERRIAR that it commenced in the lymphatics of the thigh. Many of the symptoms observed during life, and even part of the changes detected after death, evince that these views were not entirely without foundation. They wanted the support derived from post mortem research; and they constituted only a part of the morbid changes — they were merely a substitution of a part, and often only a small part, of the malady for the whole.

43. Much more recently, certain symptoms, attracting the notice of pathologists, and more than ordinary attention being directed to these symptoms, and to their origins, a different opinion of the nature of phlegmasia dolens was suggested, and former views were thrown in the shade. Thus ALBERS (HUFELAND'S *Journal*, &c., Feb. 1807, p. 16.) considered the disease as merely a form of neuralgia. He believed that it commenced in the nerves of the limb, and that the swelling was a consecutive lesion. That this is actually the case, at least in some cases, as in that recorded by Dr. DAVIES, in two or three cases seen by myself, and in others recorded by DUGÈS, KRUGER, and other physicians, cannot be doubted. DUGÈS (*Revue Medicale*, t. iii. 1824); SIEBOLD, LOEWENHARD (in SIEBOLD'S *Journ.* t. x. p. 352.); HANKEL (*Rust's Magazin*, t. xxiv.), and KRUGER (*Horn's Archiv.* t. iv. 1831), attributed the malady to inflammation of the nerves of the pelvis and thigh, or at least to a morbid state of the sensibility of these nerves, admitting, however, consecutive changes in the veins, lymphatics, and arteries of the limb.

44. NEWMANN and TREVIRANUS (*Siebold's Journ.* t. xi. p. 253.), on the other hand, considered this affection as an inflammation of the aponeurosis, or fascia lata, giving rise to an effusion of serum and lymph; whilst others even supposed it to be a form of rheumatism occurring in the puerperal state, and modified by the circumstances of this state. This opinion, supported by HIMLY and REUTER, is equally visionary with that of NEWMANN.

45. The researches of Dr. DAVIS first established inflammation and obstruction of the veins as the principal lesion of severe cases of this malady; and the investigations of BOUILLAUD, VELPEAU, J. DAVIES, BOUDAUT, and R. LEE, further illustrated this doctrine. Dr. LEE first demonstrated the origination, of at least many of the cases of the disease, in lesions of the uterus and the veins of this organ, in uterine phlebitis. So that the prevailing opinion in the present day is, that *phlegmasia alba dolens* is inflammation of the iliac and femoral veins, originating in the veins of the uterus, and often extending, on the one hand, to the common iliac veins, or even to the vena cava; and, on the other, to most of the veins in the extremity.

46. I believe, however, from considerable experience of the disease, in different circumstances, that phlegmasia dolens is a more complex affection than it is generally now considered to be — that it is not always at least a simple crural phlebitis — that it does not always, although very frequently it does, originate in uterine phlebitis — that it is not uniform in character, phenomena, and progress — and that it is a much more complex disease than it is generally viewed to be.

47. *B. Pathological Inferences.* — *a.* The disease certainly consists chiefly of *inflammation* or *obstruction*, or of *both lesions*, of the *femoral and iliac veins;* but these, although the chief, or occasionally almost the only lesions, are not always such. — *b.* The crural phlebitis, even when manifestly existing, cannot always be referred to the *uterus* for its origin, although it very frequently does so originate, especially in cases occurring after delivery. — *c.* The lesions observed in the veins appear, in some instances, as consequences of prolonged pressure, or of this cause and the sudden removal of that pressure, the disease originating in the iliac and femoral veins. — *d.* The affection appears to commence, in some cases, in the *nerves*, owing to the causes just assigned, the veins becoming consecutively affected, or being contemporaneously attacked. — *e.* Cases occur in which it is difficult to determine whether the *veins* or the *lymphatic vessels* and *glands* are primarily or mainly implicated, the symptoms and the lesions observed after death being referable to both systems of vessels. — *f.* The disease may originate in lesion of any of the *pelvic viscera*, or of the articulations or parietes of the pelvis; and, in such cases, it may not be limited to either the *veins* or *absorbents;* but may affect the one or the other, and extend to both. — *g.* The disease may be unconnected with lesion of the pelvic viscera, and may commence in the veins, or in the lymphatics or veins, or even in the nerves, and extend more or less to these vessels, especially when the patient has had the extremity exposed to pressure or injury, or to cold or currents of cold air, or to other injurious physical agents. — *h.* The precursory, early, and advanced symptoms, the constitutional phenomena, and the terminations or consequences of the affection, vary according as either of the parts, just pointed out as being implicated more or less, or any two or more of them, are prominently affected; the pain and nervous symptoms are more severe, the more the *nerves* are affected; the swelling, the general œdema of the limb, and the pitting on pressure, and the low or typhoid character of the accompanying fever, are more remarkable the more the disease is confined to the *veins;* and especially when it is preceded or attended by disease of the uterus, or of any other pelvic viscus or part; the hardness, tenseness, and heat of the limb; the tenderness of the surface, and its indisposition to pit on pressure is more manifest, the more the *lymphatics* and *glands* are concerned in the malady. — *i.* I have never met with a case of the disease in which the *arteries* were implicated.

48. V. PROGNOSIS. — Although a small proportion only of those who are attacked with phlegmasia dolens terminates unfavourably, especially when the affection appears after parturition, still it

should be viewed as a serious disease, and more particularly when it occurs in the course of other maladies which contaminate the circulating fluids. But the amount of danger should be inferred chiefly from the severity of the symptoms, from what is made apparent as to the cause and origin of the attack, and from the pathological condition manifested at the commencement and progress of the case. Pre-existing disease of the pelvic viscera or parietes; evidence of inflammation of the iliac and femoral veins; the extension of the malady to both extremities; low fever and delirium; a very rapid, soft, and small pulse, are severally indications of great danger.

49. The nature and amount of disease of the pelvic viscera, preceding and attending the attack, should always be duly estimated, as well as the nature and relations of it. When disease of the veins is detected, the extension of it to the common iliac and vena cava, and consequent contamination of the blood are to be dreaded — changes which may be often prevented by judicious practice, but which, when once induced, can rarely be removed. The passage of the affection to the other limb indicates, at least, a severe lesion of the uterine or pelvic viscera, possibly even the extension of the venous disease to the vena cava. Low fever, delirium, sopor, and a rapid soft pulse, evince contamination of the blood, and the injurious influence of this change upon the brain and nervous system, and constitution. The contingent occurrence of the affection in the course of other maladies, is always a very grave or even most dangerous circumstance; but the amount of that danger depends upon the nature of the primary disease. In malignant or cancerous maladies, in tubercular consumption, and even in some other constitutional diseases, the hopeless state of the patient depends more upon these, than upon this super-induced affection, which, however, hastens the unfavourable issue.

50. VI. TREATMENT. — It is of the utmost importance to ascertain the predisposing and exciting causes of this affection; and the pre-existing pathological conditions, especially those so frequently implicating the pelvic viscera and parietes, before the indications and means of cure are adopted. Of the considerable number of cases in which I have been consulted, I have not met with one which did not occur consequently either upon large losses of blood from the uterus, or upon blood-letting, large in relation to the state and constitution of the patient. There have frequently been marked disorders of the secreting and excreting functions, and sometimes also a cachectic habit of body. In no instance have the previous health and existing state of the patient been such as to admit of venesection, or even of local depletions to a great amount. I have never prescribed the former for the complaint; and I have ordered the latter only in a moderate degree. The uterine or other lesions in which the disease often originates, the pre-existing state of the parts which are the seats of this disease, the antecedent and existing state of the patient, and the character of the pulse and other symptoms, not merely forbid the employment of general or large local blood-lettings, but warrant the adoption of restorative, and often even of tonic remedies. But the facts, — *firstly*, that the disease generally originates in states of rapidly induced anæmia, of vital exhaustion, or of vascular contamination; and, *secondly*, that both the morbid changes in which it originates, and the pathological conditions of which it consists, become more extended, and more rapidly contaminate the circulation, after vascular depletions and depressing agents, have been either altogether unknown to, or very remarkably overlooked by, the numerous writers on this complaint.

51. The chief *indications* are therefore, *firstly*, to enable the powers of life to resist the extension of the changes constituting the malady, and *secondly*, to palliate, reduce, and ultimately remove, the symptoms and lesions which already exist. These intentions should not be carried ou altogether in succession, but in great measure simultaneously; and they are most appropriate in the cases of the disease occurring after parturition. My observation warrants me in stating, that the most dangerous symptoms have occurred in those who had been most exhausted, or lost the largest quantities of blood either before or during the disease; whilst those cases proceeded most favourably, for which the above indications were prescribed. I have certainly seen cases proceed favourably after the application of leeches in the course of the crural vessels; but I doubt any actual advantage having been derived from them. Dr. CHURCHILL remarks that, "generally speaking, venesection will not be required; but if the patient be of a plethoric habit — if she have in some degree recovered her confinement, and if the disease set in with great violence, it may be advisable." (p. 426.) Now, without denying the occurrence of the complaint in these circumstances, it certainly takes place very rarely; but most commonly in opposite conditions of the patient. Dr. R. LEE states that, in all the cases he has witnessed, "there has been so much feebleness of pulse and prostration of strength," that he has not ventured to draw blood from the arm; yet he trusts for the relief of the inflammation "to the repeated application of leeches above and below POUPART's ligament;" and recommends "from two to three dozen of leeches to be applied immediately after the commencement of the disease, and the bleeding to be encouraged by warm fomentations." "Should the relief of the local pain not be complete, it is requisite soon to re-apply the leeches in numbers proportioned to the severity of the attack, and to repeat them a third, or even a fourth time at no very distant intervals, should the disease not yield." (*Cyclop. of Pract. Med.* vol. iii. p. 349.)

52. Now I believe, that "the feebleness of pulse and prostration of strength," so very justly insisted upon by Dr. R. LEE, as forbidding a recourse to venesection, equally forbid the application of leeches in the numbers at least here recommended by him. He considers the disease exclusively to consist of inflammation of the veins, and, according to his own showing, it should be treated as such. But I am confident that neither bleeding from the arm, nor applications of large numbers of leeches are beneficial either in phlebitis, or in lymphangeitis, or even in the association of both. I state this from a very sufficient experience; and I am supported in this by JOHN HUNTER, who has insisted upon the necessity of having recourse to such remedies as will prevent the extension of the disease along the vessels, and

the contamination of the blood; neither of which objects can be accomplished by venesection, nor by the application of numbers of leeches. If, therefore, leeches be applied at all in the vicinity of the pain, or near the groin, they should be few.

53. I have shown, when treating of inflammations of the lymphatics, of the nerves, and of the veins, that blood-letting aggravates them, and that even moderate local depletions produce but little benefit; and, granting that inflammation of these vessels exists in phlegmasia dolens, and even that it originates in the pelvic viscera or parts, it is to be presumed, irrespective of the results of experience, that vascular depletions cannot be more serviceable in this malady than in the uncomplicated states of either of these inflammations. The very circumstance of the inflammation having commenced in some one of these viscera, especially in the uterus, and extended to the internal iliac veins, is a sufficient proof of the impropriety of having recourse to depletions of every kind; for, whether the complaint originates in the absorption of morbid matter from the uterus, or whether it arises in the lymphatics or veins themselves, extending along their internal surfaces, both the absorption and the disposition of the disease to extend itself, will be very remarkably increased by depletions and other depressing agents. Indeed, I have no doubt of the extension of the disease to the opposite limb being caused chiefly by blood-letting and a lowering treatment. Instead, therefore, of approving the treatment usually mentioned in the works of writers upon midwifery and the diseases of women, I would advise that which my experience, since 1820, has shown to be most efficacious, not only in this disease, but also in several maladies, occurring after parturition, as well as in others implicating the circulating vessels and fluids; and which, moreover, fulfils the intentions of cure above specified (§§ 54, 55. *et seq.*).

54. Instead, moreover, of having recourse to the more decided antiphlogistic, or rather depressing, measures recommended by most of the English and French writers on the disease, I would advise the bowels to be moderately evacuated by means of a stomachic aperient (see Form, No. 266.), or of castor oil and spirits of turpentine (from three to five drachms of each), taken on milk or some aromatic water; and of an enema containing these latter substances. The same remedies should be repeated, daily or occasionally, or as circumstances require; but I have not found it necessary to have recourse to them oftener than three or four times, although I have prescribed the enema more frequently. After evacuating the bowels by these means, a pill, containing from two to five grains of camphor, and one grain of opium, should be given, and repeated after three hours; and a third, or even a fourth, dose may be given after six or eight hours, according to the state of the patient. If there be irritability of stomach, a grain of capsicum, or a drop of creasote, or both, may be added to each dose; and these will also diminish or prevent the headache usually complained of after taking opium.

55. Immediately upon first seeing the patient, and the more especially if pain is detected in the pelvic regions, either the warm *terebinthinate fomentation* should be applied, in the way so frequently advised in this work, over the hypogastric region and upper part of the affected thigh, or flannels moistened with this *embrocation* should be kept in the same situation as long as possible, covered with a warm napkin, and renewed from time to time, as circumstances may require.

No. 324. ℞. Linimenti Camphoræ co.: Linimenti Terebinthinæ, ãã ℥iss; Olei Olivæ; Tinct. Opii ãã ℥ss; Olei Cajuputi, ʒjss. Misce bene, et fiat Embrocatio, more dicto utenda.

56. This treatment will often arrest the disease in a very short time, if it be resorted to at an early period; and, even at a more advanced stage, it will generally prevent the more dangerous symptoms, and the passage of the affection to the sound limb. If the disease be preceded or attended by an offensive discharge from the uterus or vagina, a frequent injection of a warm infusion of chamomile flowers and camphor water, with or without a drop or two of creasote, will be of service; and enemata containing spirits of turpentine, camphor, and assafœtida, may be thrown up occasionally. If the pulse be very frequent and weak, or continue in this state, after a recourse to the above means, the decoction of bark should be given, either with the hydrochloric, or nitro-hydrochloric acid, hydrochloric æther, and aromatic tinctures; or with the liquor ammoniæ acetatis, and full doses of the sesqui-carbonate of ammonia; or with the chlorate of potass and æther; and these remedies may be repeated as frequently as the case may require, and whether the swelling be abated or not, the camphor and opium being also taken as the severity of the pain and other symptoms may indicate.

57. If low fever, delirium, and other indications of extension of the disease to the common iliac veins, and of contamination of the blood be present, the decoction of bark, with the chlorate of potass and hydrochloric æther, or the alkaline carbonates and serpentaria; camphor, with aromatics and opium; the injections into the rectum and vagina above recommended; the cautious exhibition of wine, and even of brandy, with nutritious substances, as with arrowroot, the yolk of egg, &c.; and suitable articles of diet are indispensable. It sometimes happens, as I observed in a severe case, in which both extremities were affected, that the very rapid subsidence of the swelling, and consequently the rapid conveyance of the matters which had been effused into the circulation by absorption, so contaminates the blood as to occasion the most dangerous as well as alarming symptoms; the patient labouring under low muttering delirium, with sopor or coma, and a very rapid, weak, or small pulse. In this case, these symptoms did not appear until the swelling of both extremities had subsided with remarkable rapidity; they were treated as just recommended, and terminated favourably, without the least change existing in either of the limbs, shortly or long after the attack, as fully ascertained on several occasions.

58. The above treatment has been uniformly successful in the cases to which I have been called, although some of them have been very far advanced before I saw them. As I have never met with an instance of the malady that has been attended by sthenic inflammatory action, or that has occurred in a plethoric habit, or even mo-

derately robust constitutions, but in opposite states of the system, so I have not had recourse to vascular depletions. If, however, the disease should occur in the former circumstances, vascular depletions may precede the means now advised, although I believe that they are not even in such cases so indispensable as many writers have supposed, and who have most erroneously believed, that inflammatory affections are to be removed only by depletions, without duly considering that *inflammations* are various in character and diathesis, as I have shown in that article, and that they are often aggravated by a lowering treatment, and are then to be cured only by diametrically opposite means. It will be seen that I have recommended measures altogether consentaneous with my views as to the treatment of lymphangeitis, neuritis, and phlebitis, and in accordance with the sound principle laid down by John Hunter, but now so generally overlooked, namely, that in all spreading inflammations, and more especially in the inflammations of circulating vessels, the chief intention of cure should be to enable the constitutional powers to form coagulable lymph, whereby the disease may be limited, and the extension of the mischief and contamination of the system prevented; an intention to be fulfilled only by tonics and other restorative means.

59. Upon referring to the writings of the more recent writers, especially those upon midwifery, much difference of opinion as to the treatment of this disease presents itself. Whilst Denman, Dewees, Blundell, Lee, Churchill, Raige-Delorme, Davis, and others advise vascular depletions, chiefly, however, by leeches, and only conditionally by venesection, a small minority, amongst whom Dr. Burns is most conspicuous, recommend tonic and restorative remedies. Dr. Burns remarks, that "at first we may use saline draughts; but these are not to be often repeated, and must not be given so as to produce much perspiration. In a short time they should be exchanged for bark, sulphuric acid, and opiates, which tend to diminish the irritability. In the last stage we may give a moderate quantity of wine. When the pain shifts like rheumatism, bark and small doses of calomel are useful. In every stage the bowels should be kept regular." (*Midwifery*, p. 612.) It is evident from this, that Dr. Burns and myself adopt the same principle or indication of treatment, and that his remedies, as far as they are stated, are the same as those I have advised.

60. Much difference of opinion also exists as to the *local treatment* of the affection. I have already noticed (§ 55.) what appears to me the most important part of that treatment. *Blisters* were recommended to be applied to the limb, immediately upon discovering the complaint, by Mr. Sankey; and were considered by him as a specific. He advises "the first to be applied to the calf of the leg, as the pain is generally most severe in that part, and there is less fear of its not healing than if applied lower. If required he repeats the blister every two or three days, not at the same place, but higher or lower, according to the seat of the pain." (*Edin. Med. and Surg. Journ.* vol. x. p. 402.) Some difference of opinion has been expressed respecting this practice. Dr. Dewees disapproves of it, and Dr. Churchill expresses himself favourably as to it. I have seen blisters employed only in one case, and I was led to believe them to have acted favourably, by procuring copious discharges of serum and of a seropuriform matter, and thereby preventing or diminishing absorption and the extension of the disease along the vessels.

61. When the more acute symptoms have been subdued, and when the accompanying fever is either abated, or does not assume a severe or adynamic form, gentle support may be afforded to the limb by a slight flannel bandage drawn gradually tighter; and the *embrocation* prescribed above (§§ 55.) may be employed as a liniment, with gentle friction of the surface, if no abrasion of the cuticle have followed the application of it in the mode previously advised. As the disease subsides, a tonic, or at least a restorative, treatment is still generally required, with due attention to the state of the bowels; and a light nutritious diet—chiefly, however, of farinaceous articles. The best aperient in this state of the disease is that consisting of equal parts of the compound infusions of gentian and senna, with some neutral salt and an aromatic tincture (see *Form.* 266.). If the swelling of the limb continue, the supertartrate of potash may be given with the bi-borate of soda, or the latter may be taken in any aromatic or tonic infusion in *small* doses, so as not to disorder the stomach.

62. As convalescence advances, change of air, warm salt water bathing, and subsequently sea bathing may be recommended. But in this, as well as in the early periods of ailment, due attention should be directed to the uterine functions and discharges; and the treatment ought to be varied accordingly, and after due examination of the state of the uterus. At an advanced period of convalescence the preparations of iron, especially the compound steel mixture (mist. ferri comp.); or the muriated tincture of iron, with the compound tincture of camphor, are generally most serviceable: but much of the management of the patient should depend upon the circumstance of each case, upon the contingencies which may arise, and upon the complications observed in the course of the complaint.

63. *The local states of disease, described above* (§ 35.) *as either closely resembling, or being identical with, the affection now treated of*, should be viewed closely in connection with those upon which they occasionally supervene. They can hardly be treated apart from the original maladies, and in some instances they will be but little benefited by any treatment whatever, especially when they occur in the course of malignant and consumptive diseases. In other circumstances, the treatment must depend upon the nature of their exciting causes and existing pathological conditions; the *indications* being to remove them, and to enable the system to oppose their progress, or entirely to overcome them; intentions which will be best fulfilled by the means already recommended.

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PHRENITIS. See Brain and its Membranes — Inflammation of.

PHTHISIS. See Tubercular Consumption.

PICA. See Appetite — Morbid States of.

PILES. See Hæmorrhoids.

PITYRIASIS. — Synon. — Πιτυρίασις, from πιτυρον, bran; — Πιτυρόδεις, *furfurosi, quibus assidue furfures in capite gignuntur*, Galen; — *Alvarati*, Avicenna; — *Porrigo*, Celsus, Lorry, J. Frank; — *Tinea furfuracea*, Sennert; — *Tinea porriginosa*, Astruc; — *Furfurisca*, Gilbert; — *Pityriasis*, Vogel, Willan, Bateman, &c.; — *Lepidosis pityriasis*, Young and Good; *Teigne, dartre, dartre furfuracée*, Fr.; — *Hautkleie, Schuppen, kleiengrind*, Germ.; — *Dandriff, Scurf*.

Classif. — II. Order. — 2. Genus (Willan).
III. Class. I. Order (Author).

1. Defin. — *A chronic, non-contagious, superficial affection of the skin, attended by the production of minute white scales in great abundance, frequently on patches of irregular form, variable dimensions, and of a very light or dull red colour.*

2. I. Description. — *Pityriasis* may occur in any part of the cutaneous surface, sometimes on several parts in succession, and most frequently in certain parts in preference to others, but very rarely over the general surface. The patches are often attended by slight heat, pruritus, and tingling. The scales are thrown off soon after they are formed, and are re-produced with great rapidity. They are generally small and micaceous; in some situations, and in the more inflammatory states they are large and lamellar; and in others, especially in the non-inflammatory, or at least when inflammatory action is least manifest, they are minute, pulverulent, or measly.

3. The Varieties of Pityriasis, according to Willan, are the *rubra*, *versicolor*, and *nigra*. But Rayer and Wilson divide the complaint into *general* and *local*, subdividing the latter according to its situations, and consider the varieties *versicolor* and *nigra* of Willan as not properly belonging to this affection, but to those affections which consist chiefly of alterations of colour. *Pityriasis*, however, may be *simple* or non-inflammatory, and *associated* or consequent upon an erythematous or superficial inflammation of the skin. I shall, therefore, view it in these phases, the former of which has been overlooked by the writers just named; retaining also the varieties rejected by Rayer. As the local forms of this eruption are the most commonly observed, I shall consider them before I notice the more general affection, the occurrence of which is comparatively rare.

4. i. Local Pityriasis. — This complaint, according to the situation and grade of the inflammatory action attending it, has been variously denominated and described by writers since the days of Galen and Celsus down to those of Willan and J. Frank. Hence different meanings have been attached to the term pityriasis, and have occasioned no small amount of confusion. The more precise descriptions of Cazenave, Wilson, Rayer, and others, have in great measure removed this evil; but there still remain a few omissions to supply, and imperfections to remove, even in the accounts which they have furnished. *Local Pityriasis* may be non-inflammatory or *simple*, and inflammatory or *complicated*; and in either form it may present, in some cases, shades of colour different from those usually observed, even independently of any decided evidence of inflammatory action in the part — facts not sufficiently adverted to by some recent writers on the complaint. The *varieties* which I shall notice are the following: — *Pityriasis capitis, simplex et associata*; *P. palpebrarum*; *P. labiorum et oris*; *P. palmaris et plantaris*; *P. præputialis et pudendalis*; *P. versicolor*; *P. nigra*.

5. *A. Pityriasis capitis* has been too generally viewed as an inflammatory affection, and described as such. That it most frequently possesses this character, especially in adults, cannot be disputed; but it is occasionally, even in this class of patients, devoid of every inflammatory appearance. — *a. Pityriasis capitis simplex* is frequent in infants and old people, and rarely observed in the middle-aged and young. Its presence is indicated by innumerable minute white scales, which are rapidly produced and thrown off. They are thin, white, and dry, and at first adherent at one side and free at the others, but are very readily detached. Upon removing them the surface presents no inflammatory sign, but on the contrary has a dull, indolent appearance, and is without any visible capillary vessels. The exfolintion and reproduction of the cuticle proceed with various degrees of rapidity, and furnish, accordingly, quantities of these scales, which collect near the roots of the hair, and fall out upon scratching the part, or combing the hair. This form of the complaint is not attended by any, or but a slight, itching, which is chiefly owing to the presence of the accumulated scurf. It is observed chiefly in those of a dark complexion, or with black or dark-brown hair, and of a delicate constitution, or disposed to disorder of the digestive organs.

6. *b. Pityriasis capitis rubra* or *complicata* is most common, especially in the young and middle-aged. Its occurrence is indicated by a number of

minute scales, appearing in some part of the scalp; usually of a white, whitish grey, or yellowish grey colour; very thin, especially at their edges, and perfectly dry. They are often imbricated in children, but in old persons they are scattered irregularly. Their formation is often so rapid that, although they may be all detached by the comb, they will collect in nearly equal quantity in a day or two. When they thus accumulate the patient cannot scratch his head, or even arrange his hair, without detaching numbers, which fall upon his clothes in the form of a white mealy powder. When the scales are small, they are generally of a pure silvery white; but when they are larger they assume a duller, or even a darker hue. Upon separating the hairs and removing the scales the scalp is found to be dry, rough, reddened, and shining in spots or patches. In very chronic cases the surface is often of an opaque, greyish white; the cuticle appears to be thicker and coarser than natural. The scales are generally larger and thicker in this variety than in the former, and sometimes they attain a diameter of five or six lines. They occasionally form by their union a thin layer, especially in children, extending over a considerable portion of the scalp, being thickest at points where they are most abundantly evolved.

7. The most frequent seat of pityriasis is the scalp; and when partial, or in patches, it is most commonly seen about the coronal and squamous sutures, whence it may extend to the temples, forehead, and to the eye-brows. The itching attending the eruption is often annoying, causing the patient to scratch the part and to loosen showers of scurf. When the affection is of long standing, and is attended by much superficial inflammation, or where it is much irritated by scratching, it is often followed by the evolution of eczematous vesicles, and eczema auriantacea is developed from the admixture of the scales of pityriasis with the eczematous discharge.

8. This complaint may continue for many months, or even for many years, especially in the aged; and may appear also in various parts of the face and body. When it is approaching a favourable termination, the scales are not formed so rapidly, and at last they cease to be produced; the skin, however, remains for some time of a light or dull red or yellowish red, and slightly shining. But it often appears in a different part, or extends or is aggravated after errors in diet, especially after overloading the stomach, or after taking spirituous liquors or fish, more especially shell-fish; and it may thus ultimately abate and be exasperated for a long and indefinite time.

9. *B. Pityriasis palpebrarum* may exist alone; but it most frequently commences in the eyebrows, or is an extension of the eruption in the scalp. It is apt to occasion the loss of some of the eye-lashes, and to give rise to chronic irritation or inflammation of the conjunctiva. It is to be distinguished from psoriasis in this situation by the smallness and thinness of the scales, and the erythematous appearance of the patches when the scales are removed.

10. *C. Pityriasis labiorum et oris* differs in nothing from the red variety of the complaint, excepting the situation. When affecting the lips it is apt to be confounded with psoriasis; but it differs from this latter in appearing as red stains, and not as papular elevations, followed by thick squamæ. To the red stains succeed a general redness and continual desquamation of the epithelium of the lips, and occasionally of the cuticle of the adjoining skin. Desquamation of their transparent laminæ, resembling the dried healthy epidermis, proceeds along the lips, the laminæ becoming detached first at the edges, and adhering longest in the centres. The lips are tender, heated, and tumid; the epithelium is yellow and thickened; and then cracks and is detached as just stated, a new epithelium being formed under that which is about to fall off. This new cuticle in its turn becomes yellowish and cracked, and ultimately is detached, and thus the affection is perpetuated. It is different from the slighter and more transient affection, much resembling it for a short time, that follows exposure to cold and various acute diseases; and is a most obstinate complaint, at one time nearly disappearing and again returning even in a worse form than before, and with considerable swelling of the lips. M. RAYER remarks that he met with this variety in two great talkers who were frequently biting their lips. The epidermis of the external surface in the immediate vicinity often undergoes a similar redness and desquamation, although the affection is sometimes limited to the epithelium.

11. An affection of the *internal surface of the mouth*, closely resembling that of the lips, has been described by M. RAYER, and a few instances of it have been seen by myself. It consists chiefly of redness, tenderness, heat, and protracted desquamation of the epithelium of portions of the surface of the tongue and gums, and the internal surface of the cheeks, and in rare cases of the whole surface of these parts. In all the cases I have seen there has been more or less serious chronic disorder of the digestive organs.

12. *C. Pityriasis præputialis* and *P. pudendarum*. The *prepuce* of the male and the *labia majora* of the female are sometimes the seats of a superficial chronic inflammation, giving rise to exfoliations of the epithelium, and to an increased secretion of the follicular fluids of these parts, especially in persons who are subjects of pityriasis capitis; and occasionally even the external surfaces of the parts now named are also similarly affected; generally, however, to a limited extent. These affections are usually ameliorated or aggravated by the states of the digestive organs; and sometimes they entirely disappear for a time, and again return. They are always obstinate.

13. *D. Pityriasis palmaris* and *P. plantaris* are varieties which were confounded with psoriasis affecting the palms and soles, until distinguished from it by M. RAYER. This eruption commences in these situations as small red spots or stains of irregular outline, which spread and soon acquire a yellowish hue. The epidermis thickens, dries, and cracks, and is constantly peeling off in foliaceous lamellæ; the exfoliation sometimes extending to the fingers and nails. Attention to this state of the eruption at the commencement will readily determine its nature; for psoriasis begins with papular elevations, the summits of which are soon afterwards covered with dry, thick squamæ of a dull whitish colour. Pityriasis of the palms or soles is attended by painful tingling and tenderness, and increased heat, which become so much increased when the patient is warm in bed as often to break his repose.

14. E. *Pityriasis versicolor* appears in the form of continuous patches of various size, covered by a furfuraceous desquamation. It is characterised by a varied yellowish or yellowish brown discoloration of the cuticle, which even continues for some time after the cure of the complaint. It occurs chiefly on the neck, chest, shoulders, and abdomen, and rarely on the face. It is distinguished from the ephelides by the furfuraceous desquamation, and from other cutaneous affections by the peculiar pale yellow or yellowish-brown hue of the cuticle. It is as obstinate to remove as the other varieties already mentioned. In the instances of brownish discoloration, the scurfiness of the surface is often but slight; the discoloration being more deeply seated than the cuticle, and evidently existing in the rete mucosum, as remarked by WILLAN. In some cases, however, the discoloured cuticle is exfoliated, leaving the new cuticle of a red hue, as in the more common states of the affection. Mr. PLUMBE mentions instances in which no sensible elevation was perceptible to the finger when passed over the discoloration, although a dry cloth forcibly rubbed over it detached films of delicate cuticle, leaving the surface underneath tender and inflamed.

15. F. *Pityriasis nigra* is of rare occurrence. Dr. BATEMAN describes it as commencing in a partially papulated state of the skin, and terminating in a black discoloration, with slight furfuraceous exfoliations. It appeared chiefly in the extremities, and in the fingers and toes. MM. CAZENAVE and SCHEDEL state that numerous instances of this variety were observed in Paris in 1828 and 1829. The furfuraceous desquamation appeared on a deep black surface. The affection occurred in two distinct forms. In the one the epidermis was the seat of discoloration, and if detached a red surface appeared beneath. In the other, the epidermis was transparent, and the cutis vera was the part discoloured. Dr. A. T. THOMSON remarks that the affection which prevails in Mexico, termed the *pinta*, or *blue stain*, appears to be a variety of pityriasis nigra. "It commences with slight febrile symptoms, which last a few days only; and on subsiding leave the face, breast, and limbs covered with yellowish areolæ, which change to a blue, and, in advanced stages, to a black colour. The skin assumes a rough and scaly appearance, and exhales an offensive perspiration." (*Bateman's Synop. of Cut. Dis. by A. T. Thomson*, p. 77.)

16. ii. GENERAL PITYRIASIS.—*a*. This is a rare state of the complaint, and is much more rarely met with in a *simple* or *non-inflammatory form*. Yet I have seen a very few instances in persons of a dark complexion, with the limbs much covered with hair, of a furfuraceous exfoliation of the cuticle, proceeding with remarkable rapidity, and followed by as quick a removal of it in several parts of the body, but especially on the outsides of the thighs and near the joints, appearing in one part as it subsides in another, without any apparent redness of the surface either before or after the exfoliations. The scurf which is detached consists of very minute silvery white scales, which the slightest friction detaches in great numbers. These evidently proceed from exfoliation and rapid production of the epidermoid scales, either independently of inflammatory action, or in consequence of so slight a grade of it as hardly to be observed; and depend more upon the production and nutrition of the epidermis than upon increased vascular action. In the very few instances I have seen, the scalp, lower parts of the face, arms, and lower extremities were chiefly affected.

17. *b*. The *inflammatory state* of general pityriasis is oftener seen than the foregoing; although very much less frequently than the local varieties. It is a most obstinate affection, and is generally complicated with disorder of one or more of the abdominal viscera. The eruption is preceded by itching, tingling, or pricking in the surface about to be its seat. When closely examined, superficial erythematous spots or patches may be detected. The heat of the surface is increased, and the part is slightly tumid. The inflammatory blush diminishes, and even shortly afterwards entirely disappears within a few days, so that this variety of the affection, if not seen early, may be mistaken for the non-inflammatory form. The epidermis then cracks, becomes less adherent, and desquamation commences. The scales thrown off vary in their appearances with the seat of the eruption, and the grade and duration of the inflammation. On the insides of the limbs they are usually small, micaceous, and pulverulent. On the outer surfaces of the extremities they are much larger, and often vary from three to six or seven lines in diameter. They consist of foliaceous lamellæ, which continue to adhere by their centres or extremities for a considerable time after they are partially detached; and thus they appear as loosely floating on the surface. When removed, especially by friction, the parts affected are of a rose colour, and slightly tumid. When the accompanying pruritus impels the patient to scratch the part, the surface exudes a yellowish serous fluid, similar to that observed in moist eczema; and when this takes place to a considerable extent, the diagnosis is thereby rendered obscure. Behind the ears, about the axillæ, bends of the arms, groins, wrists, and insteps, the inflamed surface assumes much of the appearance of intertrigo — is rough, moist, and chapped in the direction of the natural folds of the skin. On the breast and abdomen the desquamation occurs in much larger lamellæ than on the back. On the olecranon and patellæ, and especially on the palms and soles, where the cuticle is much thicker than on other parts, exfoliation takes place in larger and thicker laminæ than elsewhere. On the face and scalp the scales are much more minute and powdery.

18. Pityriasis, particularly the more general states of it, is attended by much pruritus; but this sensation is most annoying when the eruption is recent, and the inflammation considerable; and the enjoyment, if not the relief, experienced from scratching is the greatest; but it is generally followed, when indulged in, by painful smarting, so as to disturb the rest. It is very rare that the more general states of the eruption are seen without the scalp being affected also. In all cases where this part is implicated, the *hair* is not affected or changed for a considerable time, or until the disease has continued long. It then gradually changes to grey, and becomes finer, softer, and weaker; ultimately it gradually falls out; but baldness is rarely the result, unless in aged persons, although it is generally thinner in protracted cases.

19. *c.* The *course* of general pityriasis varies in individual cases. It often appears in one place as it subsides or disappears from another, and is always a most protracted complaint. The scales become small and pulverulent, when it is subsiding or is still lingering; and large and foliaceous, when it is recent or has been irritated, and the inflammation considerable. The surface is red and moist in this latter case, and pale white, or slightly yellowish, in the former. When the eruption is most acute, or is exasperated, especially on the lower extremities, and in these even when the redness under the scales is hardly perceptible, tumefaction of the affected parts is very common, owing more probably to the thickening consequent upon the irritation, than to the state of the subjacent cellular tissue. The hair covering the limbs is much more readily lost during the eruption, than that of the scalp.

20. *d. Associations.*—I have rarely, or perhaps never, met with an instance of this eruption, whether *local* or *general*, without being *associated* with disorder of the digestive functions. In most instances there is chronic dyspepsia, often with torpor of the liver, and sometimes with indications of chronic inflammation of the mucous surface of the stomach or bowels, or of both. Flatulence is often also complained of; and in females, dysmenorrhœa, in some amenorrhœa is not infrequently also associated with it. Fever seldom attends the local or partial states of the eruption, but it sometimes appears during the more general and severe forms, or when exasperated by external irritation or a stimulating diet.

21. II. DIAGNOSIS.—The scurf seen on the foreheads of very young infants, and that on the scalp of aged persons, are not always exfoliations of the epidermis, but rather the incrustations consequent upon the state of the cutaneous secretion and neglect of cleanliness. Very slight attention, however, will enable the physician to distinguish these cases. M. RAYER remarks, "that the scalp and extremities of some adults, and especially aged persons, are occasionally affected with an habitual exfoliation of the epidermis, which differs essentially from pityriasis by being attended by neither redness, heat, nor any other morbid sensation." Now this is the condition which I have denominated *simple*, or *non-inflammatory*, pityriasis, and stated to consist of a morbid or excessive exfoliation of the epidermis. It is often attended by slight itching, and slight friction will readily induce an inflammatory blush of the surface, indicating increased irritability of the vessels of the rete mucosum, and generally also by disorder of the digestive organs.

22. The exfoliation of the cuticle in pityriasis differs from that which takes place in all the varieties of *psoriasis*. For in this latter eruption the cuticle is thickened, rough, dry, and of a dull white colour; and the red patches always rise above the level of the surface, whilst those of pityriasis are not at all prominent. In psoriasis also the inflamed surface, even when deprived of the squamæ, remains dry, whilst that of pityriasis exudes a serous fluid. In the former, the integuments are not swollen and painful, excepting in *psoriasis inveterata*, and in it only to a limited extent; whilst in the more acute or inflammatory states of the latter, they are often painful and swollen over a large extent of surface. The heat and pruritus in pityriasis also are much more troublesome than in psoriasis. The same circumstances also distinguish pityriasis from the *leprous form* of psoriasis, with this distinction in addition, that the leprous variety generally assumes a circular form, and heals from the centre to the circumference. The detachment of the cuticle in *ichthyosis* is not preceded by redness or morbid sensation of the skin; and the desquamation following chronic *lichen* and *eczema* is preceded by papulæ and vesicles.

23. III. PROGNOSIS.—Pityriasis is one of the most obstinate affections of the skin; more especially the more general forms of it. Even the local varieties are difficult to remove, and often return again and again, especially after errors in diet, and during disorder of the digestive organs. Of these latter varieties, that affecting the lips and mouth is the most rebellious. The duration and extent of the affection, and the association of it with internal disorder, as well as the nature of that disorder, should all be duly considered before an opinion as to the probable effect of treatment is given, and before the means of cure adopted. In all severe and complicated cases, more especially where the eruption is more or less general, and the digestive and respiratory mucous surfaces affected, the removal of the complaint is a work of time, and is not to be accomplished without effecting a change in the constitution by diet and regimen.

24. IV. CAUSES AND COMPLICATIONS.—The causes of this eruption are often obscure; and are more rarely local than constitutional, or such as affect the digestive organs, and through them the state of the constitution. Local irritants, the use of combs, or hard hair-brushes, the kind of soap used, and the operation of shaving, have been usually considered as exciting causes; but I believe that they are much less concerned in producing this affection than the following, namely, too full or rich living, improper or unwholesome diet; the frequent use of pork, bacon, and dried, smoked, or preserved meats, or of shell-fish; prolonged and repeated irritation of the gastro-intestinal surface, by these or by other articles of an indigestible kind; drinking cold fluids when perspiring; a morbid condition of the gastro-intestinal secretions; torpor of the liver, and a disordered state of the biliary and pancreatic secretions, exhausting discharges, and anxiety and exertion of mind. There can be no doubt of either or several of these causes being the most efficient in causing a return of this eruption in those who have been before attacked, and in aggravating all the symptoms in those who are already affected. The more general forms of the eruption are often associated with dyspepsia, flatulence, and chronic inflammatory action of either the pulmonary or the gastro-intestinal mucous surface, or even of both.

25. V. TREATMENT.— *A.* The *local varieties* of pityriasis generally require the utmost attention to cleanliness, and soothing and emollient applications.—*a.* When the *hairy scalp* is affected, with the more severe forms of this eruption, the hair should be cut as short as possible, and the dried exudations and squamæ softened by means of poultices and the vapour-douche, the latter of which should be continued for some time, and alternated with alkaline or emollient lotions. If there be much redness and heat of the surface

with serous exudation, leeches ought to be applied behind the ears, and the calomel ointment (one drachm of calomel to one ounce of ointment) rubbed over the inflamed surface once in the twenty-four hours, after carefully washing the surface with an emollient soap, such as camphor or palm oil soap. At the same time the bowels should be freely evacuated, the abdominal secretions and excretions duly promoted, and the cutaneous exhalations increased, by means of purgatives, alteratives, and cooling diaphoretics.

26. Due attention ought also to be paid to *diet*. The stomach ought never to be overloaded, and the quantity of animal food should be very much diminished, if it be partaken of largely, or even more than very moderately. Pork, bacon, veal, fish, particularly shell-fish; dried and smoked meats, and all other articles of food which are apt to occasion, or to aggravate, indigestion and gastro-intestinal irritation, ought to be avoided, and farinaceous articles of food and fresh vegetables substituted for the meat dishes which are relinquished; avoiding, however, all pickled, acid, acerb, and acrid articles whatever.

27. *b*. These means will generally remove the more recent cases of the eruption; but the more *chronic states* are often but partially relieved by them. I have considered that this and other cutaneous eruptions, which are attended by the exposure of a considerable portion of the inflamed surface to the action of the atmosphere, especially of the oxygenous portion of it, are aggravated by whatever tends to increase that exposure, either by removing the exudation and scales formed upon this surface, or by preventing their formation, and the protection they afford until a healthy epidermis is formed beneath them: and therefore, instead of advising various deterging lotions, usually recommended, I have directed the surface to be covered, when the accumulated scurf and scales have been removed, with some albuminous or gummy application which may completely exclude the air from the affected part. The albuminous portion of egg, the solution of isinglass, or of gum acacia, or of tragacanth, will answer this purpose sufficiently.

28. *c*. In those cases which are attended with flatulence, acidity, and a predominance of the uric acid or urates in the urine, and indeed in most of the forms of this complaint, a sufficient quantity of magnesia and precipitated sulphur may be taken, every night, to procure a free evacuation of the bowels in the morning; and be continued for a considerable time, observing due precautions as to diet and regimen, and attending to cleanliness. The variety of pityriasis capitis which attacks adults, and especially the aged, and is attended with little or no inflammatory action, requires chiefly attention to cleanliness, to diet, and regimen; and the removal of those symptoms of indigestion and gastro-intestinal irritation, which are so frequently observed to attend this eruption. In these cases, the alkaline carbonates, taken in gently tonic infusions; the nitrate of potash, or the hydrochlorate of ammonia, in small doses, with emollients and vegetable bitters; or these with the hydrocyanic acid, will often be of service. The bowels should also be regulated by means of magnesia and sulphur, as just advised. In these cases, dyspepsia and gastro-intestinal irritation are generally associated with debility; and we shall in vain endeavour to remove the former if we neglect the latter, or to remove the eruption if we overlook these complications.

29. *d*. Mr. E. WILSON advises, after the inflammatory action is removed, some weakly stimulating application to the surface, such as alkaline lotion, consisting of a drachm of liquor potassæ to half a pint of emulsion of bitter almonds, or camphor spirit, or a weak solution of the bichlorate of mercury. A solution of two or three grains of bichloride of mercury, in half a pint of emulsion of bitter almonds, he considers best suited for patches on the face; and the zinc ointment for pityriasis palpebrarum, præputialis, and pudendalis. The vapour bath or douche, with the white precipitate ointment, are recommended by RAYER for pityriasis palmaris and plantaris. In these varieties, I believe that the recently prepared calomel ointment, and due protection of the surface affected in the way just advised (§ 27.), will be found preferable to the means directed by these writers.

30. *B. The more general states of Pityriasis* are very frequently complicated with an inflammatory or congested state of the digestive or respiratory mucous surfaces, or with disorder of the abdominal organs; and hence the necessity of having a strict reference to these associations of disorder during the treatment.—*a*. If the patient be young, robust, or plethoric, venæsection to a moderate amount, and even the repetition of it, will be necessary, especially in recent and acute cases. Sometimes these complications appear not until the pityriasis has been of some duration; but in these blood-letting may not the less be required. Still the circumstances of the case ought to be taken into account; for this form of the eruption occasionally appears in persons exhausted by mental exertion and anxiety; and for these relaxation and a complete change of habits and modes of living are required. Temperate mucilaginous baths; due regulation of the bowels; cooling diaphoretics, especially the liquor ammoniæ acetatis, spiritus ætheris nitrici, potassæ nitras, or the ammoniæ hydrochloras, taken in emollients or demulcents; the nitro-hydrochloric acids, taken internally, or applied externally, and a farinaceous, demulcent, and vegetable diet are the means which deserve the greatest confidence.

31. *b*. If the bowels require assistance the repeated use of the magnesia and sulphur, as above advised (§ 28.), will be found most serviceable in this and in other forms of the eruption. If they become relaxed, ipecacuanha with any of the preparations of opium, or with the tinctura camphoræ composita, and a frequent recourse to mucilaginous baths, and to applications of albumen, or of solutions of gum, &c., over the more inflamed and denuded surfaces, will prove most beneficial. In this as well as in most other forms of the eruption, the preparations of *arsenic*, or even of *iodine*, are not so serviceable as in some other scaly affections, particularly when dyspeptic symptoms or gastro-intestinal disorders are present. But cases occasionally occur, in which they are very advantageously taken immediately after a meal; and when thus administered they will not induce or aggravate these symptoms.

32. Mr. WILSON remarks that the local affection "is to be treated by emollient baths, fomentations,

alkaline baths, and opium to lull the pruritus." Dr. A. T. THOMSON advises a lotion, consisting of one drachm of the solution of potash; one drachm of the dilute hydrocyanic acid, and seven ounces of the mixture of bitter almonds, to be applied to the affected surface in order to quell the pruritus. I cannot quite approve of these means of cure, for the reasons already assigned (§ 27.), especially of the more detergent substances employed, and am not surprised at their frequent failure. The treatment recommended by BATEMAN will be found more successful than that now noticed, namely, a combination of antimonials with decoction of woods, and warm baths. And when the irritability of the skin is not very great the application to the parts of an astringent lotion containing alum, or the di-acetate of lead, or a lotion containing borax. Emollient lotions and baths, containing also the sulphuret of potassium, are often useful. Mr. ERICHSEN advises them to be aided by an ointment of white precipitate of calamine, or of the oxide of zinc.

33. *c*. The *Harrowgate* and other *sulphureous waters* are often of use in all the varieties of pityriasis. In a remarkably severe case of the general form of the eruptions in a married lady, about the period of the cessation of the menses, which was under my care, a prolonged course of these waters, following an active course of medicine, effected a complete and permanent cure. The discoloured varieties of the eruption, described by WILLAN and BATEMAN, and but rarely met with, require the same treatment as that advised above.

34. In most instances, especially the more chronic and general states of this eruption, comparatively little benefit will accrue from any method of cure, if the state of the digestive organs and the diet and regimen of the patient be neglected. For in this, as well as in all other chronic diseases of the skin, a complete and enduring cure can be obtained only by a change in the constitution, brought about by a suitable diet and regimen, and habits of life. What the diet, regimen, and habits ought to be cannot be stated with precision, as they should be partially accommodated to the circumstances of individual cases; but in general those in which the patient has indulged before and during the commencement of the affection require change. Abstemious and regular habits should be adopted, avoiding rich, indigestible, and heating articles of food, and stimulating beverages, and substituting farinaceous and vegetable substances, as far as may be prudent. Mental exertion, and anxiety should also be avoided as much as possible; exercise in the open air ought to be regularly enjoyed; and sexual indulgences restrained within due bounds.*

* I have at present under my care a case of General Pityriasis in a man, of great extent and severity. He has tried courses of the solution of the iodide of mercury and arsenic, of the sulphur and vapour baths, and the Harrowgate and Leamington waters, without benefit. He is about fifty years of age, has lost an arm, is of a full habit of body, and has lived freely. A severe diet, chiefly of farinaceous and vegetable food, sponging the surface with cooling lotions, exercise in the open air, and a course of alterative medicines, were prescribed for him, but as yet the benefit derived is only partial, the restricted diet and prescribed regimen not having been observed. The great difficulty in the treatment of this and other diseases of the skin, is to convince patients of the necessity of observing a strict regimen, or rather to secure their faithful and continued adoption of the diet and regimen prescribed.

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PLAGUE. See PESTILENCE, SEPTIC OF GLANDULAR.

PLETHORA. See BLOOD, EXUBERANCE OF.

PLEURA, DISEASES OF. — SYNON. — Πλευρὰ vel πλευρον, pleura, the membrane covering the internal surface of the ribs, according to the ancient meaning; now the membrane covering the internal parietes of the thorax, and reflected over both lungs. — *Pleure*, Fr.; *Brustfell, rippenfell*, Germ.

1. I shall consider at this place those diseases which commence and are seated chiefly in this membrane; but the consecutive changes to which the pleura is liable will also receive due attention. *Inflammations of the pleura* will be first discussed, and next the *other organic lesions*, which either commence in, or consecutively implicate this membrane will be treated of; occasional reference being made to associated affections and diseases of the LUNGS (*see that article*) and of other connected and adjoining organs.

INFLAMMATION OF THE PLEURA. — SYNON. — *Pleuritis*, πλευρῖτις, πλευρῖτις νοσος, morbus lateralis, the side disease; — *Morbus pleuriticus*, Celsus; — *Passio pleuritica*, *Morbus costalis*, *Pleuresis*, Auct. Var.; — *Febris Pleuritica*, Hoffmann; — *Pleuritis Pulmonis*, *Pleuroperipneumonia*, Auct.; — *Pleuritis*, Vogel, Sagar, Boerhaave, &c.; — *Pneumonia pleuritis*, Cullen; — *Cauma pleuritis*, Young; — *Empresma pleuritis*, Good; — *Inflammatio pleuræ*; — *Pleurisie*, Fr.; — *Brustfellentzündung*, *Seitenstich*, Germ.; — *Pleurite*, *pleurisia*, Ital.; — *Pleurisy*.

CLASSIF. — I. *Class*; 2. *Order* (Cullen). II. *Class*.; 3. *Order* (Good). III. CLASS. I. ORDER (*Author in Preface*).

2. DEFIN. — i. NOSOLOG. — *Acute pain in the chest, aggravated by inspiration, commencing with chills or rigors, followed by increased heat, a hard and accelerated pulse; short, dry cough; and by difficult, short, or disordered respiration.*

ii. PATHOLOG. DEFIN. — *Inflammation, commencing in or implicating one or more parts of the pleural expansions, attended either by more or less of a consistent albuminous exudation, false mem-*

brane or adhesion, and by a fluid effusion, varying in their characters with the varying states of different cases; causing pain, symptomatic fever, disordered respiration, dulness on percussion, and alteration of the respiratory sounds.

3. *Pleurisy* has been mentioned by HIPPOCRATES and CELSUS in several places, and more distinctly by GALEN; but ARETÆUS was the first to describe it with precision, and with reference to the treatment. CŒLIUS AURELIANUS, ALEXANDER TRALLIANUS, and PAULUS ÆGINETA have also treated of it at considerable length. All these writers have viewed the disease as seated in the pleura lining the ribs, or external parietes of the chest. Modern physicians, who agreed with the ancients in limiting the malady to the pleura, did not also agree with them in believing that it was confined to this portion of the pleural surface, but that it was seated, with, probably, much greater frequency, in the pleura reflected over the lungs and other parts. Whilst BOERHAAVE, his commentator VAN SWIETEN, and others contended for the separate and distinct affection of the pleura, SYDENHAM, HOFFMANN, TRILLER, and MORGAGNI believed, that the pleura and the substance of the lungs were generally both implicated, and that the one could rarely or never be inflamed without the other being also attacked. Hence *pleuro-pneumonia*, or pleuro-pneumony, was used to designate inflammation of these distinct structures. This latter view was followed by CULLEN, PORTAL, the FRANKS, and many others. Nevertheless it is now fully demonstrated by *post mortem* examinations, as well as by the physical and rational symptoms during life, that inflammation may commence in, and be limited to, the pleura in some cases, and may be equally confined to the substance of the lungs in others; although in, perhaps, a still more numerous class of cases, it may originate in the one and extend to the other, implicating either of them more or less, as I have fully shown when treating of *inflammations of the lungs* (see Art. LUNGS, §§ 73—75.), and as the researches of LAENNEC, ANDRAL, LOUIS, CRUVEILHIER, WILLIAMS, FORBES, CHOMEL, and STOKES also have fully demonstrated.

4. It has been fully shown by Dr. STOKES that the superficial description of many anatomical writers has given rise to incorrect views as to the connection between the pleura and the parts over which the pleura is reflected. Instead of this membrane being connected to these parts simply by means of a subjacent cellular tissue, it has interposed, between it and these parts, a thin but dense fibrous membrane, which entirely envelopes the lungs, and forms a strong capsule for these organs. Dr. STOKES remarks, that this capsule, in the healthy state, though possessing great strength, *is transparent*, a circumstance in which it differs from the fibrous capsule of the pericardium, and which has probably caused its being heretofore overlooked; and that it is always more perceptible in disease implicating the pleura and subjacent tissues when they are more or less hypertrophied and rendered opaque. "This fibrous tunic invests the whole of both lungs, covers a portion of the great vessels, and the pericardium seems to be but its continuation, endowed in that particular situation with a still greater degree of strength, for purposes sufficiently obvious. It covers the diaphragm, where it is more opaque, and in connection with the pleura lines the ribs, and turning forms the mediastina, which thus are shown to consist of four layers, two serous and two fibrous." (p. 460.) This conformation of the investments of the lungs and adjoining parts is interesting in a physiological and pathological as well as an anatomical point of view. It establishes an additional analogy between the lungs and the parenchymatous and glandular organs of the abdomen, which have their fibrous capsules; and illustrates the general law of the constant association of serous and fibrous membranes, as we see in the arachnoid, pericardium, peritoneum, tunica vaginalis testis, and the synovial capsules. Considered pathologically, Dr. STOKES adds, it may explain the pain of pleuritis and pleurodynia, and the rarity of perforations of the pleura, so remarkable when considered in connexion with the frequency of ulcerations of the lung, which constantly approach so close to the surface as to be bounded by the fibro-serous membrane alone. "In pleuritis, with effusion, its existence may assist in explaining the binding down of the lung, and its corrugated appearance after the removal of the effusion." It may also be the seat of ossifications of the pleura — indeed, there can be little doubt of this being the case.

5. Notwithstanding this structure of the thoracic linings, we find that the cavities are capable of considerable dilatation, and that the mediastinum yields much more than is generally supposed, before the pressure of intra-thoracic accumulations. Hence, in empyema, or in pneumo-thorax of the left side, displacement of the heart, as Dr. STOKES has shown, occurs long before the intercostal spaces are obliterated, or even the diaphragm depressed. It is not improbable, however, that the strength of this fibrous tissue varies in different persons; indeed, with respect to the pericardium, the greatest difference of strength exists, for in some subjects it is dense and opaque, whilst in others it is nearly transparent.

6. *The varieties or states of Pleuritis* are numerous; and they have been variously denominated and arranged, according to the views of those who have described them; and to the various morbid relations they furnish.—(*a.*) Considered with respect to the character of its *progress* and *duration*, pleurisy may be either *acute* or *chronic*: and (*b*), both the one and the other may also be either *attended by pain* or *without pain* — may be *open* or *latent*. (*c.*) In relation to its *extent*, pleurisy may be *partial*, or circumscribed to a portion only of the pleura of one side, or much more extended on one side, but still *single*, or it may exist on both sides, or be *double*. (*d.*) As regards the characters of the *pathological changes* attending it, pleurisy may be *dry*, *adhesive*, or *pseudo-membranous*, or it may be *effusive*, *serous*, *sero-puriform*, or *purulent*. (*e.*) In relation to the *causes* and *circumstances of its occurrence*, pleurisy may be *primary* or *consecutive*, or it may be *spontaneous* or *traumatic*. (*f.*) In respect of *antecedent disease*, it may be consequent either upon other diseases of the chest, or upon constitutional maladies, more especially the eruptive fevers. (*g.*) Pleuritis may, moreover, be *simple* or *complicated*; — it may be *simple* from the commencement and continue so, or it may become complicated in its course, — and it may

be *complicated* from the beginning, or it may be consequent upon the malady associated with it; thus it may be associated with *catarrh*, *pneumonia*, *bronchitis*, *tubercles*, *pericarditis*, *diaphragmitis*, *hepatitis*, *rheumatism*, &c.; (*h.*) Pleurisy may be even characterised according to the *states of the system* and *the diathesis*, and the circumstances in which it occurs: thus it may be *sthenic*, or *asthenic*, or *bilious*, or *typhoid*, or *malignant*, or *cachectic*, or *puerperal*. (*i.*) It may, lastly, be *true* or *false*.

7. Having premised these remarks, I shall first notice the *causes* of Pleurisy, and afterwards describe the principal *forms* and *states* which this disease assumes, with their *terminations*, their *diagnosis*, and the *appearances on dissection*, concluding with the *treatment* which appears most appropriate to each of these states.

8. I. THE GENERAL CAUSES OF PLEURISY. — Pleurisy occurs in all *ages* and in both *sexes* — in infancy and childhood as well as in adult age; and in this latter somewhat more frequently than in old age. It is much more frequent in males than females, probably in the proportion of 5 to 3, and owing to the greater exposure of the former to the exciting causes. It is most prevalent among persons much exposed to the vicissitudes of season and weather, and those actively engaged in out-door occupations, more particularly such as require physical exertion. It is met with somewhat oftener in those of a sanguine temperament, and robust or plethoric habit of body, than in others; but this may admit of some doubt. It occurs more frequently in winter and spring, than in the other seasons, and in this it accords with pneumonia, both these maladies occasionally becoming so prevalent in those two seasons as to be almost epidemic. Nevertheless pleurisy may be more than usually prevalent also during summer and autumn, as it manifestly was during the spring and summer of 1846, during which seasons, however, there seemed to be a tendency to inflammatory affections of serous membranes, and these often of an asthenic character.

9. *A.* The *various circumstances which predispose* pleurisy are not determined with precision. There can be no doubt, however, that previous disease of the respiratory passages or substance of the lungs, or the actual presence of these and eruptive fevers, are the most frequent and influential. To these may be added the arrest of accustomed discharges, and the suppression of cutaneous eruptions and of painful affections, before the constitutional derangement of which they are the external manifestations is removed, for there are often predisposing causes, although they may not actually excite or determine this malady, other causes commonly following upon these, and determining the morbid action to the pleura or other serous membranes.

10. *B.* The most influential *exciting causes* are certainly exposure to cold in the numerous modes of its application, &c., and external injury.—*a.* The vicissitudes of season, of temperature, and of other atmospheric conditions, have a marked influence on the prevalence of this disease. It is generally supposed, that cold and dry states of the air occasion pleurisies more frequently than cold and humid states. This is probably the case, but it is not demonstrated, nor is it easily demonstrable, as there are generally numerous other circumstances which should be taken into the account. There can be no doubt, however, that cold applied to the surface of the chest, or the cold generated by currents of air passing over this part of the body, or even over other parts, and damp or wet clothes upon either the trunk or the extremities, more especially when the surface has been perspiring at the time, or shortly before, are frequent causes of pleurisy.

11. *b. Injuries or other mechanical causes* are frequent and sufficiently manifest, especially fractures of the ribs, penetrating wounds of the thorax, and contusions. I believe that the influence of the last of these has often been under-rated, and that contusions and superficial injury even of a slight kind have occasioned pleurisy more frequently than has generally been supposed. In some states of the constitution, by no means recognisable previously, superficial and painful injuries, such as severe burns, scalds and lacerations of the surface, are followed by inflammation of the pleura; and in some instances the injury may have been so severe as to have its effects propagated to the intercostal muscles, and thence to the costal pleura; but, in other instances, this explanation can hardly be entertained, although the frequency of pleurisy subsequently to such injuries fully justifies a belief in the sequence being that of cause and effect, whilst nervous communications, connections, and influence sufficiently account for the phenomenon.

12. *c.* The *pathological causes*, or antecedent diseases, require some notice in relation to the occurrence of pleurisy, more especially as the most frequent appearances of this malady are of this description. The common supervention of pleurisy upon general and lobular pneumonia, upon tubercles in the lungs, the rupture of a tubercular cavity, or tubercular perforation of the lung, and upon other organic lesions of this organ, is well known. But it is not always sufficiently recollected, at least it has not been sufficiently noticed by authors, that pleurisy is often consequent upon inflammations of the liver, of the diaphragm, and of the pericardium; and still more frequently upon rheumatism. Pleurisy may either follow or co-exist with these, and more frequently with inflammation of the liver and diaphragm than is generally supposed. It may also follow partial or general peritonitis, and become the most dangerous part of the complicated malady. It is well known that diseases of the mamma, more especially the malignant maladies of this organ, often extend to the pleura, and occasion one of the worst forms of pleuritis; and pleurisy, generally with effusion, is one of the most unfavourable consequences, and not the least unfrequent, of inflammations of the veins and of the lymphatics, of punctures or the inoculation of morbid fluids during dissections, and of organic diseases of the kidneys.

13. *Eruptive Fevers* are among the most frequent pathological causes of pleurisy, this disease commencing either during the acme of the eruptive fever, or during the subsidence of the eruption, or even during the period of convalescence. When the pleurisy appears during the acme of eruptive fevers, it may be manifest, or be marked by the other phenomena, or be latent, and be detected only after death; and it may be similarly circumstanced when occurring at any period after the decline of the eruption. In the first instance,

the concomitant pleurisy is to be imputed to the morbid poison in the circulating fluids, that has affected the pleura in addition to the external surface, and indeed other surfaces of the body. In the later appearances of pleurisy in connection with, or subsequent to, an eruptive fever, it may be inferred that the morbid condition of the circulating fluids had not been removed by the changes which had taken place on the cutaneous surface, and by the other emunctories, but that it was still sufficient to implicate the pleura, especially if exposure of the surface, in its existing state of susceptibility, favoured determination of the circulation to internal parts. Moreover, the cutaneous function is often not restored for some time after eruptive fevers; hence the blood retains much uneliminated materials, which act injuriously upon serous exhaling surfaces, and often inflame them: and this evil and its consequences are always developed or aggravated by exposures to cold, even of the most evanescent and slightest kind, during the early periods of convalescence from these fevers. Besides, the sympathies existing between the skin and serous membranes, already insisted upon (§ 11.), are also to be taken into the account when speculating on the connections of inflammations of these surfaces.

14. The *puerperal state*, more especially the first month after delivery, is not an unfrequent cause of pleurisy; inflammation of the pleura occurring then either in a simple form, or associated with peritonitis, or with pneumonia, or with phlebitis, &c. In this particular state there can be no doubt of the disease being caused, in great measure, by the condition of the blood consequent upon the absorption of morbid matters from the uterus, and even in part from the digestive canal, aided probably, in some cases, by suppression or interruption of the eliminating or depurating functions of the skin, kidneys, and intestinal canal. In many instances, also, of puerperal fever, more especially of the adynamic and malignant states of that disease, pleuritis appears both as a complication or prominent local lesion, and as a consecutive malady; and thus pleurisy, appearing after parturition, may be viewed as resulting from analogous changes to those which occasion it in connection with eruptive fevers, erysipelas, and some other diseases of the skin, namely, from the states of the circulating fluids, aided by interruption or suppression of the actions of the skin and other emunctories.

15. II. DESCRIPTION OF PLEURISY.—i. THE STRUCTURAL CHANGES CONSTITUTING PLEURISY. — It will be advantageous briefly to notice those changes in the pleura constituting this disease, in the earlier stages, and which exist in all cases, in a greater or less degree, however early treatment may arrest their progress. These changes are identical with those characterising inflammations of the *peritoneum*, and hence it will be unnecessary to do more than to notice them briefly. It is probable that, at the very commencement of the inflammation, there is a diminution of the serous exhalation that usually moistens or lubricates the pleura in the healthy state. This being the case, the friction between the opposing surfaces would be increased: but this condition would soon be followed by an exudation of lymph, or of an albuminous serum, which would assume various forms with the intensity and continuance of that inflammation, and the habit of body and vital powers of the patient. The pleura, more especially in its subjacent or more fibrous layer, and the connecting cellular tissues, becomes more vascular, more opaque, and somewhat thickened, at least, subsequently; and the lymph effused more copious. The liquid or lymph poured out consists of serum—an augmentation of the serous exhalation, —and of a material of nutrition, the albuminous, the coagulable, or albumino-fibrinous portion. If the inflammation continue, even for a short time, the exudation of these materials, in variable proportions in different cases, proceeds rapidly, and gives rise to changes depending much upon the proportion of the latter material contained in the serous fluid. In its smallest proportion, the coagulable material is held in solution by the effused fluid; and, when withdrawn from the body, it gelatinises upon cooling, the liquid mass assuming a jelly-like appearance. When the coagulable portion is more abundant, it forms films or coats of lymph upon the surface of the membrane; and this deposition is generally the more considerable, and the more disposed to speedy organisation, the more acute the inflammation, the more plethoric and robust the patient. This coagulated lymph thus forms the false membranes, and the substance of the adhesions so frequently formed between the surfaces of the inflamed pleura. But the false membranes may exist with or without adhesions, the existence of adhesions depending much upon the quantity of the fluid effusion between the pleural surfaces. This effusion, especially when considerable, will generally gravitate to the most depending portions of the pleural cavity; and there, especially, it will tend to keep the pleuræ separate. But if the upper portions of the pleura be inflamed, they will more readily adhere, unless the fluid be very abundant. If the pleura be inflamed only in their lower expansions, a small quantity of fluid will be sufficient to keep them apart. When the lymph effused on the inflamed surfaces becomes organised it forms a false membrane; and if the lymph cover opposite surfaces, adhesions, through the medium of these membranes, often become firm or permanent. When the liquid effusion is small, or even considerable, various adhesions may be formed, and vary in number, appearances, and extent, in connection with the effusion; or partial adhesions, co-existing with false membrane, may exist without any, or with very slight, effusion. In more prolonged cases, and in various other circumstances, which will appear in the sequel, various consecutive changes are observed in the pleura, and in the matters effused in its cavity; but these will be more fully noticed hereafter.

16. ii. THE SYMPTOMS AND SIGNS OF PLEURISY. — *A*. OF SIMPLE ACUTE PLEURISY — or STHENIC ACUTE PLEURISY. — This, as well as other inflammations, generally commences with chills or rigors, the continuance and severity of which are generally in proportion to the severity of the attack. The rigors are either preceded, or accompanied, or followed — for no precise order of procession of their symptoms is observed — by pain or stitch in the side, aggravated by inspiration and cough. To the rigors succeed heat of surface and the usual phenomena of sympathetic inflammatory fever, which vary with the

constitution, idiosyncrasy, and vital power of the patient. The respiration is short, frequent, sometimes nearly forty in a minute, superficial, and anxious. Inspiration is interrupted, or, as it were, cut short, by the lancinating pain. Cough is dry and suppressed. The chest, on percussion, furnishes a dull sound on the affected side; and, at the same time, there are diminished motion and sound of respiration, with other morbid signs, on that side. The accompanying fever is attended by nocturnal exacerbations, with more or less manifest remissions. From the fifth to the ninth day the fever subsides, either with or without critical changes. The pain of the side abates, and with it the feeling of oppression or tightness, and expectoration and respiration become more easy. Still the local changes, evinced by percussion and auscultation, remain, and often continue for a considerable period; and even, to a certain extent, during life. But more commonly they gradually disappear, and the patient recovers health and strength. Dulness on percussion is the sign which is the last observed, the breath-sound returning often long before the dulness entirely disappears. These phenomena result from the several products of inflammation collected in the cavity of the pleura, that are generally removed during the period of convalescence. This view of the symptoms of pleurisy requires, however, a more particular examination, in respect both of the diagnosis and of the treatment.

17. *a. The pain or stitch in the side*, characteristic of this state of the disease, indicates a more or less developed period of it. This pain is sharp or lancinating, often severe, recurs at each inspiration, and prevents the dilatation of the thorax, thus confining inspiration within certain limits. Its seat is most frequently under the nipple, at the margins of the lateral attachment of the diaphragm. It has been asked, to what is this pain owing? M. CRUVEILHIER answers this question by referring it to the friction of the costal pleura over the pulmonary pleura, which he believes to be greatest at this situation. But I doubt the existence of much friction between these surfaces; and believe, that the pain is to be imputed chiefly to the stretching of the inflamed fibrous layer of the membrane during inspiration, and to the development of its morbid sensibility by this act. The pain may be felt in other situations besides that now mentioned. It may exist at any part of the affected side of the chest. It may even extend to the lumbar region, or to the lower margins of the ribs and down to the crest of the ilium; and it may exist in the mammary and sub-sternal regions, and rise as high as the margins of the third or second rib, extending even to the shoulder. The pain varies as to intensity and duration: it may be permanent or temporary, remittent or intermittent. It may be so intense as to threaten suffocation or asphyxia, either from attempting to move, or owing to the inability to dilate the chest. This, however, is most remarkable in extreme cases, and in those of *double pleurisy* (§ 61.). In other instances the pain is comparatively slight, and is felt chiefly during a full inspiration, or upon coughing or sneezing, &c. In some cases, the pain extends over nearly the whole of the side, and is increased upon pressure, especially on the intercostal spaces, upon percussion, &c. I have seen also the pressure of the stethoscope endured with difficulty, and a certain degree of puffiness or œdema of the side or of the external parietes. In a case of pleurisy consequent upon hepatitis, very recently under my care, this external œdema and tenderness were very remarkable. I have imputed these phenomena to inflammation of the costal pleura, and to the external propagation of several of the local changes, especially excited vascular action, increased sensibility, and serous infiltration to the sub-cutaneous cellular tissue. Moreover, the pain may be entirely absent, or may exist in a situation which may not suggest the existence of pleurisy: and hence the disease has been called *latent Pleurisy*, which will be considered hereafter (§ 49.).

18. *b. Respiration* is short, interrupted, superficial, and very frequent. It may even reach fifty in a minute. The frequency of respiration is generally in proportion to the severity of the pain, which checks the dilatations of the chest, and creates a necessity for an increased frequency of the act. In these cases, a sudden attack of cough or sneezing almost threatens asphyxia; but I cannot agree with M. CRUVEILHIER that asphyxia ever occurs under these circumstances, unless in double pleurisy, when much effusion has taken place. Great frequency of respiration may, however, exist independently of pain; but, in this case, there is generally considerable effusion. Hence this state of respiration, although no pain is complained of, should always induce a suspicion of the existence of pleurisy. When the remarkable acceleration of breathing is caused by the effusion, then attacks of cough, sneezing, &c., may be followed by fatal asphyxia, but this issue more frequently supervenes without either of these contingent causes having occasioned it.

19. *c. Cough* most frequently attends pleurisy; but it is short, dry, and suppressed, owing to the pain it causes. It sometimes, however, brings up some bronchial or tracheal mucus, and when pleurisy is complicated with catarrh, then the cough is much more severe and distressing, and often attended by a copious expectoration of the sero-mucous fluid of catarrh. Occasionally the catarrhal symptoms are not developed until the acute stage of pleurisy is subsiding, and when a free, abundant, and copious expectoration then takes place, it may be viewed as being critical; but when the sputum is viscous, adheres closely to the vessel, is rusty or streaked with blood, it may then be considered an indication of the extension of the inflammation to the substance of the lungs, and to the minute bronchi.

20. *d. Immobility of the thorax* on the affected side has been considered characteristic of pleurisy; but this is the case only to a certain extent, and is not to be depended upon, for in many severe cases it is difficult to see much difference in the degree of motion of both sides, or of different parts of the same side. Besides immobility is often caused by pain, which may exist in the side independently of inflammation, as will appear hereafter.

21. *e. Decubitus* is most frequently on the back during the acute stage of pleurisy; sometimes it is upon the sound side, and rarely on the affected side as long as pain is considerable; but when effusion has taken place, and the acute stage has passed away, the patient can lie only on the back or

on the side in which the effusion exists. Indeed, in all chronic cases of pleurisy, or whenever effusion into the pleural cavity is great, the lung on the sound side only remains capable of performing the respiratory functions, and it necessarily requires to be unembarrassed during the discharge of these functions, either by position, or any other circumstance.

22. *f. The Fever*, attending pleurisy, may precede, for two or three days, the local symptoms, or accompany them. It generally subsides before these symptoms disappear for a longer or shorter period. The heat of surface varies considerably, but generally it is co-ordinate with the strength and hardness of the pulse, and is increased towards evening or night. The fever is seldom perfectly continued; it is generally slightly remittent; sometimes more manifestly so. It is much less frequently intermittent, although the latent form of the disease often presents complete morning or daily intermissions. The pulse is hard, concentrated, or constricted, and more or less accelerated, whilst in pneumonia it is full and developed. Hardness of the pulse was considered by BAGLIVI as the most distinctive symptom of pleurisy. The concentration and hardness of the pulse are generally remarkable in proportion to the acuteness of the pain. When effusion takes place, or is considerable, especially about the third or fourth day or later, the febrile symptoms subside, or remit more decidedly, and sometimes the pulse intermits. These phenomena may be referred to the influence produced by the effusion upon the functions of the lungs and heart, and consequently upon the blood itself. The least mental or physical agitation, however, occasions great acceleration of the pulse in these cases, and a febrile exacerbation returns at night.

23. Although the sharp pain in the side, catching and restraining every inspiration, and rendering deep breathing or coughing almost intolerable; the short breath and short dry cough thereby caused; the hard and quick pulse, heat of skin, &c., are often characteristic of pleurisy; yet acute inflammation, and its most important consequence, copious effusion, may have existed for many days in the pleura, without this array of symptoms. Even effusion may have taken place to a very great amount without either disturbing the respiration very sensibly, or even rousing the sensibility of the parts, if it have proceeded gradually or slowly. On the other hand, the *physical signs* are more to be depended upon than those symptoms which have been now considered. And, although they do not indicate the intensity of the inflammation, they seldom fail in announcing the presence, and most serious consequences of it. I shall therefore analyse these signs in the order in which they commonly appear.

24. *B. Physical signs of Pleurisy.—a. Diminished motion* is usually observed as already stated, and is at first to be imputed to the pain; but, as pain may exist independently of inflammation, this sign cannot be depended on. The sound of respiration is also diminished in proportion as the movements are restrained in the parts affected with pain.

25. *b. A sound of friction*, or a creaking sound, is sometimes heard during the movements of the chest. This is ascribed by Dr. STOKES, M. REYNAUD, and others, to a defective lubrication of the opposite pleural surfaces during the early or incipient stage of inflammation—to a *dry pleurisy*. Dr. WILLIAMS ascribes this sound to the presence of lymph, and believes that its production is favoured by the lung being partially distended or pushed against the walls of the chest during respiration. It is most apt to occur where the lung is confined by adhesions or false membrane, or partially distended by tuberculous or other deposits. This sound is commonly heard about the middle parts of the chest. It generally ceases as soon as effusion into the pleural cavity is announced by percussion; but in the dry pleurisy it may continue for a long time. Dr. WILLIAMS remarks that, in three cases in which the sound was heard a few days before death, the pleura were thinly coated with a few small patches of soft granular lymph; and that on gently rubbing the lung upon the costal pleura a friction-sound was produced by the patches, but by no other part of the pleura. The pleural inflammation and effusion were very slight in these cases.

26. *c. Dulness on Percussion*, at the most dependent parts of the affected side, is present when effusion has taken place; but there may also be some dulness on percussion of other parts, or where a considerable effusion of lymph, or false membrane, is interposed between the opposite surfaces. The effused fluid collects in the lowest part of the cavity, floating to some extent the lung upon it; and hence the dulness in that part. As, however, the vesicular and peripheral parts of the lung yield more readily to pressure than the tubular or more internal parts, the fluid mounts up, as it accumulates, between the lung and ribs, and occasions more or less dulness, which is then distinctly heard if the percussion be gentle and abrupt. But in all cases the sound should be compared with that emitted by corresponding parts on the sound side.

27. *d. Diminished sound of respiration*, with diminution of the extent of the motions of respiration, necessarily result from the accumulation of fluid in the pleural cavity. The breath-sound is more and more weakened and shortened as effusion proceeds; and is ultimately abolished in most parts, excepting those about to be noticed. This sign, as well as that preceding and those following it, may be modified, or rendered less distinct, by adhesions previously existing between the pulmonary and costal pleura.

28. *e. Ægophony*, or the modification of the vocal resonance so denominated, occurs when the dulness on percussion and diminution of the respiratory sound reach the middle regions of the chest. The vocal resonance is heard more distinctly than usual in those regions, "and it is superficial, as if produced in the spot, separately from the oral voice; and it is changed to a small bleating, trembling note, which so much resembles the voice of a goat, that LAENNEC termed it ægophony. This modification of the voice is heard most distinctly between the third and sixth ribs, which corresponds with the situation of the middle-sized bronchial tubes; about the spine it is generally mixed with more of a common bronchophony from the larger tubes at the root of the lung." The liquid interposed between the lung and the parietes of the chest renders the voice more audible in the above situation, by condensing the tissue of the lung, and thereby making it a better conductor

of sound. The layer of fluid thus interposed, being thrown into vibration by the sound propagated from the bronchial tubes, transmits the voice to the ear of a tremulous and wiry character, or imparts to the voice, heard upon auscultation in this situation, this particular character. The high or sharp tones of the voice are best transmitted in this way. Hence ægophony is most evident in boys, women, and children with high voices. In persons with a bass voice it is more commonly limited to the inferior angle of the scapula, or near the spine; and it then approaches nearer to bronchophony from its being seated in larger tubes.

29. As the liquid increases, the ægophony becomes weaker, more distant, and loses much of its tremor; the sound much resembling a small deep-seated voice, or a silvery echo of the original. This is owing to the amount of effused fluid, and to the compression of the lungs and tubes; and, when these are much increased, the sound ceases altogether. It has not been ascertained, what quantity of effusion is sufficient to produce this last effect. Dr. WILLIAMS thinks that much sound of the voice is not transmitted when the layer of serum exceeds an inch in thickness. If the ægophony continue stationary for several days, it may be inferred that the effusion is moderate, and increases very slowly—which is a favourable sign. But it is often very transient; and cases often do not come under treatment until the pleuritic effusion has become too great to give rise to ægophony. Former and existing adhesions, however, modify this as well as the other physical signs. When ægophony is most distinct it is often accompanied with bronchial respiration, especially between the scapulæ, where, also, there is a good deal of common bronchophony with it. Indeed, ægophony is merely the bronchial voice modified by transmission through a layer of fluid; and hence it may be changed into bronchophony by causing the patient to change his position so as to allow the fluid to gravitate to a different part of the cavity. Hence, also, ægophony and bronchophony often present mixed and doubtful states, which do not admit of easy distinction, although they differ sufficiently when their respective characters are well marked. The former may be stated to be a *tremulousness* of the voice when it is superficial, and an echo-like smallness when it is deep-seated; whilst the latter may present several other varieties.

30. *f. The diffused vibration of the voice*, which is usually felt by the hand applied to the chest, is generally intercepted and prevented by effusion into the pleural cavity. M. REYNAUD first pointed out this sign, and showed, that the vibration caused by the voice pervading the common tissue of the lung, and transmitted to the parietes of the chest, is muffled and destroyed by a layer of fluid interposed between the lung and the parietes, although ægophony may be heard at the same spot, the vibrations of the latter being too fine to be felt by the hand. When dulness on percussion is caused by solidification of a portion of the lung, the vocal vibrations are transmitted with unusual force from the tubes to the walls of the chest, and hence the opposite effect occasioned by the fluid interposed becomes an important diagnostic sign, in regard of these lesions. Partial adhesions, however, of the lungs to the costal pleura may very materially interfere with these phenomena; for there may be even more vibrations than usual felt at the adhering parts, or where the lung is pressed close to the walls of the chest; and, on the other hand, there may be solidification of the lung, and fluid or other obstruction in the bronchi may prevent the fremitus of the voice from being transmitted through them; or more or less fluid may be interposed between the solidified lung and the walls of the chest.

31. *g. Ægophony and all sounds of the voice cease* throughout the affected side, as the liquid effusion increases, excepting within two or three inches of the spine; or where the lung may adhere to the walls, which frequently happens at the upper parts of the chest. The sound of respiration is not heard in all the parts of the affected side, except the interscapular region and under the clavicle; but it is much weaker in these parts.

32. *h. Enlargement and immobility of the affected side* may always be detected when the effusion is considerable. This side is first seen to be larger than the other at the end of expiration; it not diminishing equally with the sound side, especially at its lower region. The difference between the sides may be rendered more evident by encircling the chest by a piece of tape, and by fixing it at the spine and sternum; when the tape will slacken and tighten with expiration and inspiration more evidently on the sound, than on the diseased side, which latter remains more fixed in proportion to the amount of effusion, and degree of distension. As the effusion augments, the enlargement of the side becomes the more obvious to the eye during the respiratory act, the want of symmetry being apparent in whatever position the side is viewed from; but the amount of difference should be ascertained by measuring the chest horizontally with a piece of tape. Having made the tape, or ribbon, to meet at the middle of the lower end of the sternum, it should be taken at the precise point of its crossing the spinous processes of the vertebræ, and the difference of length between the two sides will give the amount of enlargement; recollecting, however, that the right side of an adult is about one-third of an inch larger than the left.

33. *i. Displacement of the parts and organs bounding the effusion* becomes more and more manifest as the amount of fluid increases. LAENNEC, and many after him, have remarked that the intercostal spaces on the side of the effusion do not present their usual depressions; and that they are sometimes, especially in chronic cases, equal with the surface of the ribs, or even more prominent than they are; but this sign is hardly perceptible in acute cases, unless in the more asthenic states, and when the patient is thin or emaciated. In such cases, Dr. WILLIAMS has noticed an evident fluctuation, which, however, is a rare occurrence. The smoothness of the side, from the yielding of the intercostal muscles and consequent obliteration of the spaces, as well as the yielding of the diaphragm, and the pushing before it of the viscera of the upper regions of the abdomen, are remarkable when the effusion is great, and are ascribed by Dr. STOKES to paralysis of these muscular parts, consequent upon the inflammation of their serous linings. "The true explanation," he remarks, "of the protrusion of the intercostals and diaphragm will be found to

be, that they are affected by paralysis following inflammation of a contiguous structure—that their contractile powers are lost, and that hence they yield easily to a pressure, which in their healthy state (as in vesicular emphysema, in hydrothorax, and the first stage of pleurisy) they effectually resist." (p. 464.)

34. Displacement of the organs more immediately adjoining the effusion, especially that of the heart and of the liver, is one of the chief indications of the existence and of the amount of liquid effusion into the pleural cavity; and was first noticed by Dr. STOKES and TOWNSEND. When effusion is considerable in the left side, the consequent displacement of the heart renders its recognition easy. In this case the pulsations of the heart are felt and heard most distinctly under or to the right of the sternum, or as low as the epigastrium, instead of between the cartilages of the fourth and sixth left ribs. If the effusion be on the right side, the liver is pushed down much below the margins of the ribs, and its position is easily traced by percussion and by the touch. It may even be pushed so far as to form a tumour in the abdomen, and hence lead to a serious mistake in the diagnosis, if the symptoms and signs referrible to the thorax be not duly investigated. When effusion in the right cavity is very great, the heart may also be pushed further than usual to the left, and it may be felt beating to the left of the nipple, or even below the axilla. The mediastinum may also be displaced by a copious effusion, so that a dull percussion sound will be given out over nearly the whole of the sternum, and even for half an inch beyond it upon the sound side, owing to the mediastinum being pushed to this side by the effusion, which thus occupies the space behind the sternum. The dulness on percussion in these cases is most evident below the juncture of the second rib with the sternum. The above displacements may also be caused by air in the pleural cavity, but in this case the tympanitic sound would be present instead of dulness.

35. *k. The motions and sounds of the healthy side*, especially when compared with those of the affected side, indicate either no sign of disease, or an increase of the signs of healthy action, owing to the increased work performed by the sound side. This side moves more fully and rapidly than usual, and the respiratory sound is so loud in it as to resemble the respiration of children.

36. *l. Old, or even recent, adhesions* very remarkably modify the physical signs of pleurisy. When the adhesions are loose, or are stretched by the effused fluid, so as to form bands traversing the effusion, or cells filled with fluid, the lung may be thereby kept at a moderate distance from the parietes of the chest, and ægophony would thus be continued as long as this state continued. Where the adhesion is extensive and close, fluid poured out in the vicinity will compress one part of the lung, and stretch and ultimately compress the part adjoining, in or near the place of adhesion. Thus, as not infrequently observed, adhesions may be found in the upper regions of the chest, and the fluid effusion in the lower parts may be so great as to press the lungs against the upper portion, and there occasion a loud bronchophony and bronchial respiration transmitted from the large tubes by the adhering dense column of lung; and thus the case may be mistaken for one in which cavities exist underneath this situation; but the prominence of the intercostal spaces, the dulness on percussion, the enlargement of the side, and the displacement of parts as above described (§§ 32, *et seq.*) will readily distinguish its real nature.

37. In rarer instances, the pleura of the upper and posterior parts of the lung may be affected, and that of the inferior portions may be adherent to either the diaphragm or lower walls of the chest. In these, the lung will be pressed, by effusion into the upper and posterior parts, against the anterior or other portion of the walls of the thorax, according to the seat of effusion, and to the manner in which the fluid is bounded by the adhesions or false membranes; and the sounds will be tubular, loud, or clear, or otherwise vary, with the part of the lung thus pressed to the sides of the chest, and with the proximity of the larger bronchial tubes; and a more or less loud bronchophony will also be heard.

38. *C. Consecutive changes in Acute Sthenic Pleurisy.*—If inflammatory action subsides in consequence either of the treatment or of the effusion which takes place, *absorption* of the fluid and of the lymph usually results, and the compressed lung expands under the efforts of respiration in proportion as absorption proceeds. The signs evincing the increased effusion gradually disappear; and ægophony and the sound of respiration return in the situations, generally the upper parts of the chest, where they were last heard. With the return of these, the side assumes its natural appearance, and a gradual improvement takes place of the sound on percussion. In modern cases, as Dr. WILLIAMS remarks, the fluid is absorbed before—indeed long before—the lymph or albuminous matter is removed; and when the pleural surfaces covered with this matter come together, a rubbing or rustling sound is sometimes heard, which soon ends in the adhesion of these surfaces by bands, or by more continuous false membranes. If these false membranes are formed after the fluid has been removed, and the lung has recovered its full expansion, they are adapted to its free motions, which are not materially interfered with by them. Hence adhesions are often formed, which are lengthened in the lower parts of the chest, where the lungs descend somewhat as the ribs rise, and which are short in the upper parts, where the lungs more closely follow the movements of the parietes.

39. In severe cases, the inflammation continues after the effusion has become abundant; and not only increases or perpetuates the fluid effusion, but also throws out "albuminous matter in various conditions, which by its present qualities or subsequent changes may produce a variety of prejudicial effects, all tending more or less to interfere with the restoration of the organs to a healthy state." These consequences arise from the continued or unsubdued inflammation, whether it has been imperfectly treated, or entirely neglected; and they furnish strong proofs of the value of the physical signs, which are never absent, and which rarely fail to point out the existence of these consequences. They will come more appropriately under consideration under the heads of *Chronic Pleurisy* (§§ 63, *et seq.*).

40. *D. Terminations of Acute Sthenic Pleurisy.*—The most frequent terminations of this form of pleurisy are—1st, by resolution,—2d, by passing

into the chronic state,—and third, by fatal asphyxia.—*a. Resolution* may be complete, the effused fluid and the false membranes being absorbed, cellular adhesions being the only traces left of the disease; or it may be incomplete. In this latter case, the fluid effused is absorbed, but the false membranes remain, undergo changes, and occasion phenomena, which will be noticed when the *second* of these terminations are considered.—*b. Death by asphyxia* may occur in the most severe cases, either in double pleurisy, or in the single state of the disease when the effusion is rapid and very great; but this termination is much more frequent in pleurisy than in pneumonia. It is, moreover, very rare in the acute stage and simple form of the disease; it occurs chiefly in the chronic stage, and in the more complicated states.

Before I proceed to describe the changes observed in the pleura and in the matters thrown out on the surface of this membrane after inflammation of it, I shall first notice the several states or forms of pleurisy which differ from that which has now been described, as being the more common type of the disease. Certain of these, indeed, differ from that just considered in very little further than in the seat or limitation of the disease, or in the stage, period, or continuance of it; and hence the necessity of considering them all in close connection.

41. ii. DRY PLEURISY—the *Pleurisie sèche* of ANDRAL.—*a.* This *state* of the disease deserves notice chiefly because it has been particularised by Dr. STOKES and M. ANDRAL; for it can hardly be considered a distinct *form*, but rather as being particular periods, of pleurisy modified more or less by peculiarity of constitution and by the grade of inflammatory action. Dr. STOKES remarks that this term may be applied to that form in which nothing is effused but lymph. The characters of this state in general are, that the constitutional and local distress is comparatively slight, that organisation rapidly advances, that the sound is clear, or nearly so, on percussion, the phenomena of accumulated effusion being wanting, and that the friction signs are evident. Dry pleurisy occurs, according to these writers, as an original and uncomplicated disease, or as consecutive of fever, erysipelas, or diffuse inflammation. It may be associated with or succeed to any of the diseases of the lungs, or occur as a complication of cardiac or hepatic disease. The circumstances in which I have met with it, in the least equivocal form, are either associated with, or consequent upon, acute rheumatism, acute hepatitis, and pneumonia.

42. *b.* The *physical conditions* of dry pleurisy Dr. STOKES believes to occur in two stages of the ordinary disease; namely, in the earliest periods before effusion takes place; and in the latter stages, when the liquid effusion is absorbed. In the first case, the duration of the friction phenomena depends on the rapidity of effusion; in the second, on the vigour of the constitution which influences the process of organisation. At the commencement, pain is often felt in or near the situation of the inflammation, but it soon subsides. The characters of the friction-sound, generally soon afterwards heard in the situation of the pain, are various; but this sound always conveys the idea of two rough or dry surfaces moving uninterruptedly upon each other. It accompanies inspiration and expiration, but it may be absent during ordinary breathing; and yet become manifest on forced respiration. In some instances the rubbing sensation is felt by the patient for a long time, but the sound may often be heard long after he ceases himself to feel the obstruction. Dr. STOKES states, that the friction-sound in the early stages of the simple disease, or immediately after the absorption of an empyema, is often accompanied by a rubbing sensation, perceptible to the hand.* Like the former sign, this may be absent during ordinary breathing, but become manifest when the patient inspires deeply. In the progress towards cure, this is the first of the physical signs to subside; it is apparently connected with the least organised state of the effused lymph.

43. The duration of the friction-sound, depending upon the absorption of the fluid and the rapidity of organisation, varies remarkably in different persons; it is comparatively short in the young and robust; while in the feeble and cachectic it may continue without changing, especially when the disease is consecutive or complicated, longer than a month. It is rarely heard, or continues but a short time, at the commencement of pleurisy, attacking the cachectic, or complicating febrile maladies. When, however, it follows the absorption of an effusion, it may continue from several days to some weeks. It is heard most distinctly over the middle parts of the chest. The friction is rarely heard when the dry state of pleurisy is consequent upon pneumonia with hepatisation of a considerable portion of the lung. It is more distinct when the pleurisy is consequent upon, or complicated with, acute hepatitis. When pleurisy is associated with pericarditis, the rubbing-sounds seem double, but the combination of that caused by the action of the heart, with that following respiration, often causes a confusion, which requires attention and practice to distinguish and duly recognise.

44. *c. The causes of the friction-sounds* have been differently stated by pathologists. These sounds, variously modified with the nature of the case, have been heard in certain states of inflammation of the pleura, pericardium, and peritoneum; and, as they have not been heard in those states which are attended by a copious liquid effusion, but in that in which an unorganised lymph is presumed to exist on the surface of the inflamed membrane, so they have been viewed by M. RENAUD, Dr. CORRIGAN, and Dr. STOKES as being caused by the presence of this lymph in the situations where these sounds are heard. Still this cause admits of doubt; for the *creak*, or *leather-creak*, admitted to be one of these friction-sounds, is rather to be viewed as given out by the membrane itself in certain morbid states of it, than by the friction of the opposite surfaces when covered by unorganised lymph. The fact, however, of Dr. CORRIGAN having produced the sounds in question by rubbing two portions of the inflamed membrane one upon the other, may appear conclusive of this point; still I believe the matter still to require further examination.

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be, that they are affected by paralysis following inflammation of a contiguous structure—that their contractile powers are lost, and that hence they yield easily to a pressure, which in their healthy state (as in vesicular emphysema, in hydrothorax, and the first stage of pleurisy) they effectually resist." (p. 464.)

34. Displacement of the organs more immediately adjoining the effusion, especially that of the heart and of the liver, is one of the chief indications of the existence and of the amount of liquid effusion into the pleural cavity; and was first noticed by Dr. STOKES and TOWNSEND. When effusion is considerable in the left side, the consequent displacement of the heart renders its recognition easy. In this case the pulsations of the heart are felt and heard most distinctly under or to the right of the sternum, or as low as the epigastrium, instead of between the cartilages of the fourth and sixth left ribs. If the effusion be on the right side, the liver is pushed down much below the margins of the ribs, and its position is easily traced by percussion and by the touch. It may even be pushed so far as to form a tumour in the abdomen, and hence lead to a serious mistake in the diagnosis, if the symptoms and signs referrible to the thorax be not duly investigated. When effusion in the right cavity is very great, the heart may also be pushed further than usual to the left, and it may be felt beating to the left of the nipple, or even below the axilla. The mediastinum may also be displaced by a copious effusion, so that a dull percussion sound will be given out over nearly the whole of the sternum, and even for half an inch beyond it upon the sound side, owing to the mediastinum being pushed to this side by the effusion, which thus occupies the space behind the sternum. The dulness on percussion in these cases is most evident below the juncture of the second rib with the sternum. The above displacements may also be caused by air in the pleural cavity, but in this case the tympanitic sound would be present instead of dulness.

35. *k. The motions and sounds of the healthy side*, especially when compared with those of the affected side, indicate either no sign of disease, or an increase of the signs of healthy action, owing to the increased work performed by the sound side. This side moves more fully and rapidly than usual, and the respiratory sound is so loud in it as to resemble the respiration of children.

36. *l. Old, or even recent, adhesions* very remarkably modify the physical signs of pleurisy. When the adhesions are loose, or are stretched by the effused fluid, so as to form bands traversing the effusion, or cells filled with fluid, the lung may be thereby kept at a moderate distance from the parietes of the chest, and ægophony would thus be continued as long as this state continued. Where the adhesion is extensive and close, fluid poured out in the vicinity will compress one part of the lung, and stretch and ultimately compress the part adjoining, in or near the place of adhesion. Thus, as not infrequently observed, adhesions may be found in the upper regions of the chest, and the fluid effusion in the lower parts may be so great as to press the lungs against the upper portion, and there occasion a loud bronchophony and bronchial respiration transmitted from the large tubes by the adhering dense column of lung; and thus the case may be mistaken for one in which cavities exist underneath this situation; but the prominence of the intercostal spaces, the dulness on percussion, the enlargement of the side, and the displacement of parts as above described (§§ 32, *et seq.*) will readily distinguish its real nature.

37. In rarer instances, the pleura of the upper and posterior parts of the lung may be affected, and that of the inferior portions may be adherent to either the diaphragm or lower walls of the chest. In these, the lung will be pressed, by effusion into the upper and posterior parts, against the anterior or other portion of the walls of the thorax, according to the seat of effusion, and to the manner in which the fluid is bounded by the adhesions or false membranes; and the sounds will be tubular, loud, or clear, or otherwise vary, with the part of the lung thus pressed to the sides of the chest, and with the proximity of the larger bronchial tubes; and a more or less loud bronchophony will also be heard.

38. *C. Consecutive changes in Acute Sthenic Pleurisy.*—If inflammatory action subsides in consequence either of the treatment or of the effusion which takes place, *absorption* of the fluid and of the lymph usually results, and the compressed lung expands under the efforts of respiration in proportion as absorption proceeds. The signs evincing the increased effusion gradually disappear; and ægophony and the sound of respiration return in the situations, generally the upper parts of the chest, where they were last heard. With the return of these, the side assumes its natural appearance, and a gradual improvement takes place of the sound on percussion. In modern cases, as Dr. WILLIAMS remarks, the fluid is absorbed before—indeed long before—the lymph or albuminous matter is removed; and when the pleural surfaces covered with this matter come together, a rubbing or rustling sound is sometimes heard, which soon ends in the adhesion of these surfaces by bands, or by more continuous false membranes. If these false membranes are formed after the fluid has been removed, and the lung has recovered its full expansion, they are adapted to its free motions, which are not materially interfered with by them. Hence adhesions are often formed, which are lengthened in the lower parts of the chest, where the lungs descend somewhat as the ribs rise, and which are short in the upper parts, where the lungs more closely follow the movements of the parietes.

39. In severe cases, the inflammation continues after the effusion has become abundant; and not only increases or perpetuates the fluid effusion, but also throws out "albuminous matter in various conditions, which by its present qualities or subsequent changes may produce a variety of prejudicial effects, all tending more or less to interfere with the restoration of the organs to a healthy state." These consequences arise from the continued or unsubdued inflammation, whether it has been imperfectly treated, or entirely neglected; and they furnish strong proofs of the value of the physical signs, which are never absent, and which rarely fail to point out the existence of these consequences. They will come more appropriately under consideration under the heads of *Chronic Pleurisy* (§§ 63, *et seq.*).

40. *D. Terminations of Acute Sthenic Pleurisy.*—The most frequent terminations of this form of pleurisy are—1st, by resolution,—2d, by passing

into the chronic state, — and third, by fatal asphyxia. — *a. Resolution* may be complete, the effused fluid and the false membranes being absorbed, cellular adhesions being the only traces left of the disease; or it may be incomplete. In this latter case, the fluid effused is absorbed, but the false membranes remain, undergo changes, and occasion phenomena, which will be noticed when the *second* of these terminations are considered. — *b. Death by asphyxia* may occur in the most severe cases, either in double pleurisy, or in the single state of the disease when the effusion is rapid and very great; but this termination is much more frequent in pleurisy than in pneumonia. It is, moreover, very rare in the acute stage and simple form of the disease; it occurs chiefly in the chronic stage, and in the more complicated states.

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longer duration, and comprehends all the changes observed in the pleura and sub-serous cellular tissue (see § 112.), but without, as is supposed, any serous effusion. Now, he adds, that he has never encountered this dry stage as described; having always, even at the very outset, found the serous fluid somewhat, however slightly, augmented in quantity, and marked by its deep yellow tinge and its increased consistency. There were, likewise, present those greyish or yellowish points, the initial and quickly expanding rudiments of membranaceous formations. "The so-called *dry pleurisies* of ANDRAL (*Clin. Med.* 4mo edit. t. iv. p. 405.)," he continues, "are therefore probably to be understood in a comparative sense only—effusion too scanty to be detected by physical signs during life. Such a ground of distinction is, however, obviously opposed to the strict principle of pathological anatomy." The second stage has been viewed as eminently that of effusion, which, although not confined to any one period, is not sufficiently copious and characteristic to constitute a secondary and distinctive stage, until the original inflammation has become thoroughly developed. But to divide the period of effusion into two stages, and thus to attempt to discriminate between the development of liquid effusion on the one hand, and of coagulable lymph and adventitious membrane on the other, are discordant with the process which gives rise to these productions. The third period has been considered to be the organisation of the plastic exudation. This, however, does not take place at any particular stage, nor is it a process to which every form of plastic effusion is necessarily subject. It would be difficult to reconcile, in this arrangement, those pleuritic exudations, which exhibit traces of organisation after the first twenty-four hours, with those in which the organising powers has been ineffectually exerted for weeks or months. Whilst, therefore, this division might seem justified in some instances by the procession of morbid phenomena, it would in others be quite inapplicable. It would probably be preferable to consider the secondary changes in pleurisy according to the degrees of intensity of the primary inflammatory act, and to the rapidity with which they ensue upon this act.

46. *E. Pleurisy as above considered*—whether it be attended by little or no liquid effusion at an early stage, by a rapidly increasing and abundant effusion, or by more or less organisation of the exuded lymph—generally presents *a sthenic character*, more especially when it occurs primarily, and in a previously healthy constitution. It then, particularly in the young, robust, plethoric, or sanguine temperament, is accompanied with highly inflammatory symptoms, local and constitutional; runs its course frequently with great rapidity, and evinces a greater tendency to the organising or formative process, even although effusion to a great extent may rapidly supervene. The sthenic character may also exist, although in a much less marked degree, in more delicate or even in lymphatic subjects, especially when the disease is primary, but it is then attended by much less fever, and less severity of local suffering, the symptoms more nearly approaching the state of the disease next to be noticed. The sthenic character may likewise be evinced in pleurisy consecutive of, or complicated with, pneumonia, hepatitis, pericarditis, or acute rheumatism, in all which, although it sometimes assumes more or less completely, or approaches to, the asthenic character, the sthenic is more frequently observed, unless in the aged, the debilitated, and cachectic.

47. iii. ASTHENIC PLEURISY. — *Pleuritis Nervosa*, RICHTER;—*Cachectic Pleurisy.*—This form of pleurisy is generally met with in persons who have been debilitated by previous acute or chronic diseases; in the cachectic, or those subject to some constitutional vice; in persons whose constitutions are broken down by intemperance and dissipation, and more especially in the course of other maladies in which the circulating fluids are contaminated either by the absorption of morbid matters, or by interruption of any of the eliminating or depurating processes. It thus not infrequently supervenes in the course of, or during convalescence from, typhoid or adynamic fevers, exanthematous fevers, puerperal fevers, erysipelas, organic changes in the kidneys, phlebitis, diffuse inflammation, or spreading and diffuse suppuration, and consecutive abscesses. In all these, effusion is more or less rapid, the dry stage hardly or not at all exists, and albuminous exudations either are not formed into membranes and adhesions, or do not become organised, unless a change is produced during the course of the disease in the states of vital power and of vascular action. Indeed, in the majority of cases of asthenic pleurisy, the albuminous portion of the exudation is more or less mixed with the serous fluid, the fibrinous or fibro-albuminous character not being present.

48. This form of the disease is seldom attended by acute or painful local symptoms. It is generally *latent*, and often effusion is far advanced, or has long existed before the disease is detected. It is rarely a primary affection—is most frequently associated with some other disorder, or structural change. It is sometimes very sudden in its occurrence, and indicated at first by the shortness and frequency of respiration, by the position of the patient, and the sinking of the powers of life, rather than by local distress or pain, or by febrile symptoms, which, if they be present, are usually of an adynamic character. This state of pleurisy, as may be expected from its nature and the circumstances in which it appears, is always removed with great difficulty, or not removed at all, especially if copious effusion has taken place before it was detected. It may supervene, in the course of the maladies just mentioned (§§ 47.), and escape detection until dissection after death discloses its existence, although attention has been directed to its contingent appearance, especially when the effusion has been small, or when it has taken place shortly before death. I have thus met with it in the last stage of malignant or infectious puerperal fevers, in open cancer of the mamma, confluent small-pox, &c. I have seen albuminous exudations covering the pleura in some of these cases, but the serous effusion was abundant, and the membranes formed by these exudations evinced no indication of incipient organisation.

49. iv. LATENT PLEURISY. — *Pleuritis Occulta*, RICHTER. — The term *latent* has been applied to pleurisy when it takes place without pain in a situation where it can be referred to the pleura. And this state of the disease is

more frequently associated with the *Asthenic*, than with the *Sthenic character* — or in other words, Asthenic pleurisy is much more frequently latent than Sthenic pleurisy. M. CRUVEILHIER supposes that this state of the disease is more frequent than any other. The numerous instances of adhesions between the opposite surfaces of the pleura found on dissection of cases, in which no symptom of pleurisy had been complained of, appears to justify this opinion. Still we often hear of instances of pain in the side ascribed to pleurodynia, or to rheumatism of the intercostal muscles, where a more accurate examination may have detected pleurisy. Besides, pain is often present for a time, and either overlooked or forgotten, or ascribed to some other than the real cause.

50. *Latent Pleurisy* may be either *acute* or *chronic*. In its latter state, it will be noticed hereafter. It may be either *primary*, or *consecutive*, or *associated* with some other disease. Pleurisy may be latent in either of two ways, owing — 1st, to the absence of all pain whatever; — 2d, to pain being felt in some part remote from the thorax, and suggesting the existence of disease in some other quarter. This *second form* of latent pleurisy has hitherto not been noticed by writers; but I have met with several instances of it, and recently with three cases which were primary and uncomplicated. In all these, the pain was referred to the iliac region of the same side, no pain being felt in the chest, at any part, upon a full inspiration, or when coughing, although it was excited in that remote situation. In most cases of latent pleurisy there are chilliness, thirst, heat of skin, especially in the trunk, dryness of the general surface; and as effusion becomes copious shortness of breathing, with more or less difficulty or oppression upon the least exertion. This form of pleurisy often affects children and old persons, and in both classes of persons, it is frequently associated with catarrh or influenza. Indeed, so often is this complication met with in these subjects, that a careful examination of the chest should be made in all cases of severe catarrh or influenza affecting them.

51. v. PARTIAL PLEURISY.—Circumscribed or partial pleurisy may occur *primarily* or *consecutively* of other diseases, but much more frequently in the latter than in the former state. Circumscribed or limited pleurisy may also be attended either with *adhesions* only, or with *effusion*, adhesions however, of various extent also existing in the latter class of cases. — *A. The adhesive form of partial pleurisy* is very frequent, and is commonly consecutive of tubercular formations in the lung, of either of the forms of pneumonia, and of inflammatory irritation of any kind in the vicinity of the part of the pleura becoming thus affected. It is a very usual consequence of tubercular depositions, softened tubercles or cavities, when either approach to the surface of the lung; the pulmonary pleura then becoming inflamed, and throwing out lymph which agglutinates it to the opposite costal or diaphragmatic pleura, most frequently to the former at its upper regions. The pleuritic affection is in these cases often slight, but it is seldom latent to the close observer. It is generally indicated by more or less pain, uneasiness or tenderness, in or over the part affected; by a feeling of constriction or tightness, by frequent superficial breathing, and by diminished motion of the ribs in that situation; somewhat increased dulness on percussion, increased pain or uneasiness upon stretching or exerting the adjoining muscles, and a greater intolerance of a strong percussion over the part, than in any other place, are often also present. The pain is sometimes sharp, evanescent, and even so slight or brief in duration as hardly to be noticed or recollected. This form of partial pleurisy is often salutary in its effects, in respect of the tubercular malady, of which it is so generally a consequence, inasmuch as the adhesions between the opposite pleural surfaces prevent ulceration and perforation of the pulmonary pleura, and the escape of the tubercular matter into the pleural cavity. Although this state of the disease is sometimes latent, it is less frequently so than has been stated by some writers, it being rather overlooked, owing to the slightness or evanescence of the symptoms just mentioned.

52. *B. Partial Pleurisy with Effusion* is much less frequent than the foregoing.—(*a*). It is commonly a consequence of a more general state of the disease, in the course of which adhesions have taken place between the opposite surfaces in one part, and effusion or even suppuration in another. In some instances, the pleurisy attacks a person who has previously been the subject of this disease, and in whom adhesions of greater or less extent already exist; and this subsequent attack affects merely that portion of the pleura which is non-adherent; the adhesions limiting the extension of the inflammation, and bounding the liquid effusion, or purulent formation. Partial pleurisy accompanied with liquid or puriform effusion, may occur in any situation; but its nature can seldom be ascertained with any degree of certainty during life.

53. (*b.*) The above observation applies to *interlobular pleurisy*, or inflammation, and its consequences affecting the opposite surfaces of two corresponding lobes of the lungs. This particular form of partial pleurisy is rarely primary, but is generally consequent upon the more general state of the disease, or upon tubercles in the lungs or pneumonia. The *vomicæ*, so often said to have been found in the lungs, have very probably been puriform collections, between the opposite pleural surfaces, circumscribed by adhesions, in this and the preceding states of partial pleurisy.

54. (*c.*) The question has been put by M. CRUVEILHIER, whether or not a *costal pleurisy* can exist independently of a *pulmonary pleurisy*, or the latter exist without the former? BICHÂT believed that it could not, and contended that the inflammation always extended from the one surface to the other continuously, or without any interruption at the non-adherent parts. I am convinced, however, that this is not the case, unless in the asthenic or spreading form of the disease; but that the inflammation originating in either surface is followed by an exudation of lymph which acts as an irritant, when brought in contact with the opposite surface, and inflames this latter; and thus inflammation, or adhesion, or even effusion, are often developed in the opposite surfaces without the continuous extension of the morbid action over the intervening non-adherent or unaltered part of the membrane.

55. It has been supposed by some writers that inflammation of the pulmonary pleura is not attended by pain; and that pain is felt only or

chiefly when the costal pleura is implicated. This opinion has been considered to derive much support from the different anatomical connections of the two portions of this membrane. This distinction, however, is by no means determined; further and more precise observation is required before an opinion can be given respecting it.

56. (*d.*) *Costo-pulmonary pleurisy* may be attended by liquid, or sero-albuminous, or puriform effusion or collection, limited by adhesions to a smaller or larger space, as shown above (§ 52.). The circumscribed purulent collections — the *empyema necessitatis* of various writers — sometimes met with, and that point externally, are of this kind.

57. *C. Mediastinal Pleurisy.* This form of circumscribed pleurisy has been considered, as far as the subject admits of consideration, in the article MEDIASTINUM. It is unnecessary therefore to add more at this place than to remark, that inflammation may originate in that portion of the pulmonary pleura in contact with the mediastinum, and extend to this latter, forming adhesions between them, and giving rise to liquid or puriform effusion, which may be bounded by these adhesions. In cases of considerable duration, the liquid collection may assume puriform and encysted appearances. The exact nature of these cases is seldom accurately ascertained during life; for they are most frequently secondary and complicated with pneumonia, or with tubercles in the lungs, or even with pericarditis. The symptoms of this state of the disease, as far as they are known, are the same as those stated in the article MEDIASTINUM (§§ 3. *et seq.*).

58. *D. Diaphragmatic Pleuritis* is of frequent occurrence, especially in the course of inflammations of the liver and peritoneum, and even, although much more seldom, of the liver and of the spleen. —(*a*). This form of pleurisy may be consequent upon either acute or chronic disease of these parts, especially upon the former. I have at another place (see LIVER, §§ 41. *et seq.*) remarked upon the not unfrequent extension of inflammation from the liver to the diaphragm and diaphragmatic pleura, and even also to the costal and pulmonary pleura: and, although this occurrence is sometimes met with in connection with abcess of the liver, it also not unfrequently takes place in the course of sero-hepatitis, or in cases of inflammation of the superior serous surface of the liver, and of partial peritonitis in the superior abdominal regions. I have met with several cases of acute sero-hepatitis in which the inflammation rapidly extended to the pleura, the disease consisting, during the great part of its course, of hepatitis complicated with pleuritis.

59. It is very rare, however, unless in cases of this kind, that is, in those consequent upon inflammaiton of some one of the abdominal viscera, that pleurisy is limited to the diaphragmatic pleura; and even in those, it soon extends more or less to the pulmonary or costal pleura of the same side as that on which the viscus first attacked is situated. This mode of extension is not, however, always observed; for, in a case at this moment attended by me, but which I did not see at its commencement, there are chronic hepatitis, with tenderness in the region of the liver, effusion into the peritoneal cavity, and pleuritic effusion into the left pleural cavity, the heart being pushed towards the right side of the chest.

60. (*b*). The *symptoms* of Diaphragmatic pleuritis differ but little from those of the more usual states of pleurisy. Generally, however, when this portion of the pleura is more especially affected, there are acute pain, augmented by inspiration, by physical efforts, by vomiting, or even by the eructations of flatus, and seated at the base of the thorax on either side, or about the attachments of the diaphragm to the thoracic parietes; anxiety, difficulty of breathing, or orthopnœa, the patient being obliged to sit up, with the trunk of the body bent forwards; an anxious and distressed expression of the features; sometimes nausea or vomiting, and singultus; and considerable symptomatic fever occasionally with delirium. When effusion is considerable, or collections of sero-puriform or purulent matter are present between the base of the lungs and the diaphragm, this latter is pressed downwards, and considerable fulness, with dulness on percussion, is observed in the hypochondrium of the affected side, and thus the semblance of an enlarged liver or spleen may be occasioned. When the liquid collection is completely circumscribed between the base of the lungs and the diaphragm, the diagnosis is usually difficult. The antecedent symptoms, especially pain or stitch in the side, with symptomatic fever, ushered in by rigors, will indicate the nature of the disease. Complicated cases, however, may occur, in which the diaphragmatic pleura is affected on the one side, and the peritoneum, or some infra-diaphragmatic viscus on the other, and be attended by great difficulty of ascertaining the exact seat and extent of mischief; but a careful examination of the physical signs and the symptoms during the progress of the disease, and a due recollection of the fact that inflammations not unfrequently extend from one side of the diaphragm to the other, especially from the peritoneal, to the pleural surface, will often aid the physician in his diagnosis. In some cases of diaphragmatic pleurisy of the right side, excessively acute pain along the margins of the right side; short anxious respiration, jaundice, protrusion of the liver downwards by the fluid effused between the diaphragm and lungs, and much symptomatic fever, were the most prominent symptoms.

61. vi. DOUBLE PLEURISY.—*a.* Pleurisy rarely attacks both sides of the chest at the same time and in a primary form: but instances of this double disease occasionally present themselves, especially in a secondary form, and consecutively of adynamic, or malignant, or of exanthematous fevers, of erysipelas, or of those states of constitution which have already been noticed as imparting an asthenic character to pleurisy, more particularly morbid states of the circulating fluids. In double pleurisy both sides of the thorax are not always affected to an equal extent, nor are the inflammatory products always the same, in respect either of the effusion, or of the more consistent exudation. One or other may be much more abundant in one side than in the other, and even be otherwise modified or different; and very generally the patient is carried off, either by asphyxia, or by the effect upon the powers of life occasioned by the extent of lesion, before effusion has taken place in both pleural cavities to a great amount, or before the false membranes which may have been exuded has presented any advancement towards organisation.

62. b. The *symptoms* and *signs* of double pleurisy in most instances readily evince the extent of the disease. In some cases, however, there is difficulty in determining—1st, the existence of pleurisy; and 2d, its presence in both sides of the thorax. When effusion takes place, then the bronchial respiration, egophony, and the obscurity of the sound, can leave no doubt as to the nature of the disease. The sound emitted on percussion is attended by greater difficulty, because the means of comparison are wanting. Pain is not always a certain symptom, as it may be wanting in either side, although the amount of disease may be even greatest in the side where it is not felt. Generally, however, the history of the case, the state of respiration, the positions of the patient, and the constitutional symptoms, viewed in connection with the physical signs, will indicate the extent of the malady. This state of pleurisy is much more dangerous than the ordinary forms; indeed the patient may be carried off by it, aided by some other associated complaint, before the more advanced lesions have supervened, and even before the amount of effusion, or the character of the symptoms had admitted of the recognition of the full extent of the malady.

63. vii. CHRONIC PLEURISY. — EMPYEMA. — Pleurisy assumes every grade of severity, of activity, and even of duration. It may be most acute, a respects the degree of suffering, and the rapidity of its progress; and it may be most latent in its character, and slow in its course, and in the progress of the successive changes attending and consequent upon it. Between the extremes of these, the intermediate grades of morbid action and duration, and shades of character are innumerable. *Chronicity*, therefore, in respect of pleurisy is, perhaps, more of a conventional term, than as regards almost any other malady. The *chronic state* of this disease is commonly consequent upon the acute, when this latter has been either neglected or improperly treated; but it is also sometimes primary, or rather the advanced or prolonged state of a pleurisy which has commenced in a latent and silent, perhaps, also, in a slight or sub-acute form, and has continued thus to advance until the amount of effusion has given rise to phenomena such as have been described above (§ 30. *et seq.*), and as could not be neglected any longer by the patient or overlooked by the physician. Chronic pleurisy may even be an *intercurrent* malady, or supervene secondarily in the course of some other disease, although not so frequently as acute pleurisy. Thus it may occur in the course of chronic disease of some contiguous viscus, as of the lungs, liver, spleen, peritoneum, stomach, &c., or of malignant affections of the mamma, or diseases of the skin, &c.; whilst the acute states of pleurisy most commonly occur in the course of malignant or adynamic, exemthematous, and other fevers; or of inflammation of adjoining organs. Chronic pleurisy may thus, as well as in other forms of succession, be *complicated* with some other disease: indeed, it frequently becomes thus associated from the very circumstances of its duration.

64. Chronic pleurisy, in the state of full development, is attended by great effusion of fluid; and to this condition, whether it be the consequence of a violent attack, or of a sub-acute, or of a latent state of the disease, the term *empyema* has been given, although the composition of the fluid effused is often very different from pus; it being more frequently serous, sero-albuminous, or sero-puriform, or sero-sanguineous, as will be more fully shown in the sequel.

65. Although I agree with Dr. WILLIAMS that the transition of the acute to the chronic state is so indefinite, and the symptoms of the recent disease sometimes have so little of an acute character, whilst that of a long duration occasionally manifests so much greater an intensity of irritation, that the terms acute and chronic would seem to be less applicable to pleurisy than to other inflammations, still I cannot consent that the distinction in question should be altogether set aside. I readily, however, subscribe to the circumstance that much of the difficulty connected with this distinction is to be ascribed to the anatomical relations of the pleura: this being a shut sac, it is liable to have its acute inflammations rendered chronic by the retention of the inflammatory products; and the chronic state is equally liable to be excited into an acute state by the irritating and distending influence of these products, more especially the fluid products. Still differences in character or form, in connection with duration, are very apparent in many cases, — in the prevalence of high inflammatory fever, severe local suffering, and rapid progress in some; or in the absence of fever, or in the existence of hectic or remittent fever, with but little or slight local suffering or discomfort, and slow progress or long duration in others, — in the sthenic character of vascular action and vital power in many, — in the asthenic condition of both action and power in some, — and in the varying grades of pain, of irritation, and of sympathetic disturbance in all. These differences can hardly be described in all their phases of existence as they are presented to our view in practice: but they require to be pointed out in such a way as will most remarkably fix our attention, and render them safe guides in devising our indications and means of cure.

66. *Effusion* being the characteristic condition of *chronic pleurisy*, as well as of the advanced state of the most frequent form of *acute pleurisy*, it follows, that all that has been stated above with reference to the latter (§ 24. *et seq.*) is equally applicable to the former. The disease, whether denominated acute pleurisy with effusion, or chronic pleurisy with effusion, or empyema, — or whether or not the liquid be purulent, or sero-albuminous, or of any other description hereafter to be noticed,—is attended by the same local and physical phenomena and signs, however much the states of vascular action, of vital power, and of constitutional disturbance may differ, in each case, with its duration and progress. *Chronic effusion*, even to the extent of compressing the lung, and displacing the mediastinum, and even the diaphragm, may exist without distressing constitutional symptoms, which may either have subsided, or, in fewer cases, never existed. Dr. STOKES truly remarks that, if we separate the *physical signs*, we find nothing characteristic in the general symptoms alone. Hectic may or may not be present; and no characters of the cough, expectoration, respiration, decubitus, or, with a single exception, the appearance of the patient, are sufficient to distinguish this from other diseases of the lung. This exception is the dilatation of the side and intercostal spaces. But if, in addition to

the symptoms of pulmonary irritation and obstruction, as shown by cough, shortness of breathing, dyspnœa, increased by exertion, or by lying on the affected side, and by a sense of fulness and oppression referred to one side, which is often œdematous, the physical signs of fluid accumulation, compression, displacement, &c. be also present, we may safely diagnosticate the disease.

67. In certain cases, the general symptoms are nearly wanting. Instances are not rare of persons with copious effusion of considerable duration, to be without fever, pain, or local distress; to look tolerably well, and to have good appetites; to lie nearly equally well on either side, and even to pursue their usual occupations, when these are not laborious. The physical signs are hence of the utmost importance in chronic pleurisy; indeed, of greater value in this than in any other thoracic disease. Most cases of bronchitis, of pneumonia, and of phthisis can be at least recognised, as Dr. STOKES remarks, without these aids; but such is not the case with pleurisy; and it is fortunate that its physical signs are more simple, numerous, and striking than those of any other of the complicated diseases of the lung.

68. When chronic pleurisy is not accompanied by much fever or pain, the patient may not be obliged to keep his bed. He complains only of shortness of breathing on exertion; and he often pursues his usual occupations. He merely believes himself indisposed, and considers that he is not the subject of serious disease, until the pallor and emaciation of his features, the general loss of strength and flesh, the coldness of the extremities, the short suppressed cough, the frequent and short respiration, increased on the least exertion or mental emotion; the loss of appetite, the rapidity of his pulse, especially during evening exacerbations, of hectic; and the inability of lying on any other than the same side, attract his notice, and direct the attention of the physician he consults to the nature of his complaint. These symptoms having suggested the seat of the mischief, an examination of the chest readily discloses its nature and extent.

69. *B.* The *physical signs* of chronic pleurisy are those already described (§ 26. *et seq.*) as evincing extensive fluid accumulation in the pleural cavity; but they become, with several of the general symptoms, much modified by the duration of the effusion, and by the changes in the pleura and lung. The state of the liquid effusion also modifies the course and phenomena of the disease; and hence it is necessary to notice briefly those changes which thus influence the character of the malady. When pleurisy has continued for some days, alterations take place not only in the more consistent exudation, but also in the fluid effused. These alterations depend much upon the diathesis of the patient, and the states of vital power and vascular action; and although some of them may be inferred to be present by the symptoms and signs during life, yet others are, owing to their nature, incapable of being indicated until disclosed after death.

70. (*a.*) In healthy, young, and robust persons, lymph of a highly organisable quality is thrown out upon the inflamed surface, of greater or less thickness, with a serous effusion; and this lymph, forming a layer, or false membrane, over the surface, although diminished by absorption, becomes more dense as it is organised, and thus restrains the expansion of the lung, and impedes the absorption of the accumulated serum. In cases where the membrane is less dense or thick, the expansion of the lung and the absorption of the fluid may proceed, especially when vital power is not defective, until ultimately the fluid is removed, and the lung acquires very nearly or altogether its natural expansion. In this case adhesions, cellular, partial, or otherwise, may form, and the functions of the lung not be materially impeded (see § 115.).

71. (*b.*) In other cases, by no means different from the above, or varying only in the states of vital power and vascular action, and generally of a less active inflammation and more prolonged duration, organisation proceeds slowly, and the false membrane is of a more dense and rigid nature. Consequently the lung is prevented from expanding, even although the fluid effused be partly or nearly altogether absorbed. In many cases, especially in those of considerable duration, the false membrane covering the lung shrinks or contracts in its superficial extent, in the manner stated when describing the changes consequent upon peritonitis, or like cicatrices after burns of the skin, and thus not merely prevents the expansion of the lung, but actually compresses this organ still more closely. In more chronic cases, the membranes formed on the pleura assume a state of cartilaginous induration, or become more or less extensively ossified, or they may be cartilaginous in parts and ossified in others. These changes often coexist with the shrinking just noticed, and are to be ascribed in part, in some cases at least, to the irritation produced by the effused fluid on the surfaces enclosing it.

72. (*c.*) In some cases, when the vital energy is insufficient to enable the inflamed surface to throw out a readily organisable lymph, the exuded matter assumes a curdy appearance, of greater or less thickness, almost solely albuminous, and presents much less of a fibrinous character than in the foregoing cases; and the fluid part of the exudation is turbid, or contains loose shreds or pieces of albumen (see § 116, 117.). In some instances a false membrane of some density is found covering the inflamed surface, but it is imperfectly organised, or presents no traces of organisation. In other cases, a coating of albumen, without adhesion or organisation, covers the pleura, the fluid effusion being turbid, serous, or sero-albuminous, or otherwise changed or coloured, according as colouring particles of the blood may be exuded. This class of cases is more frequently of much shorter duration than the foregoing classes, are always asthenic, and are more closely allied to the acute asthenic form of the disease (§ 47.), being more prolonged instances of that form.

73. (*d.*) The albuminous or nutritive matter may be thrown out in a more diffused form with the serum; or the formative process, characterising so frequently inflammations of serous surfaces, may be still less exerted, and a puriform, or sero-puriform fluid only be produced. It is probable that, in some instances, when the immediately preceding state (§ 72.) of the disease is much prolonged, the sero-albuminous exudation may pass into a puriform or sero-puriform state. This purulent state of the effused fluid appears most

frequently in the most chronic cases, but it also is sometimes observed in the most acute, and is that to which the term *empyema* is strictly applicable. It depends rather upon the state of vital power, or the diathesis of the patient, in connection probably with the condition of the blood, than upon the duration of the disease. Dr. WILLIAMS very justly remarks, respecting this state of the disease, that "the solid matter is thrown out in a disintegrated state, utterly insusceptible of organisation, and diffused through the fluid in flakes or particles, forming a mixture more or less resembling pus, which is the fluid or empyema. Although in many instances this is the result of a more chronic form of pleurisy than that which forms lymph, and owes its persistence and tendency to increase to the want of vitality in its solid matter, yet we do meet with cases of empyema which arise from very acute forms of inflammation. In these instances the fluid is more strictly purulent, the solid matter being in the form of globules, like those of pus; and seems to be the result of what may be called a suppurating diathesis, in consequence of which all the albuminous products of inflammation tend to assume a purulent character." It should be remarked, also, that the continued access of air will cause the inflamed pleura to secrete pus instead of coagulable lymph; this membrane being similarly influenced by this cause to other tissues. Whenever pleurisy is consequent upon perforation of the lung, the effused fluid is always purulent.

74. (*a.*) The other lesions which are contingently associated with chronic pleurisy, especially the tuberculous, schirrous, encephaloid or fungoid, and melanotic, generally proceed from their respective constitutional taints: they will receive due consideration hereafter.

75. It is obvious that the above states, into which the lesions of chronic pleurisy may be divided, are not precisely defined in all cases; but that instances occur, owing to changes of vital power and vascular action in their course, in which intermediate conditions, or transitions from one state to another, may be found on close examination. The truth is, that, in many instances, even after the acute action has subsided to the chronic state, the retained effusion, owing to the nature and combination of the several elements, may rekindle an acute or subacute state of action, or keep up a continued irritation, which cannot fail of producing a varied series of changes not only in the false membranes, but also in the pleura itself and the subjacent tissues; and that the effused fluid, as well as the surrounding structures, both natural and adventitious, will consequently undergo changes varied in numerous ways, although most frequently presenting the general features now pointed out, and those about to be more minutely described (§ 118. *et seq.*).

76. In some cases the condition of lesion, in respect both of the more consistent exudation and of the fluid accumulation, may be predicated during life from the indications of vital power and vascular action furnished by the patient. The *first* and *second* of these conditions (§ 70, 71.) are generally attended by a more sthenic state or diathesis; by less failure of constitutional power, and a stronger grade of vital resistance. The *third* (§ 72.) is accompanied with more marked asthenia, — with greater depression of vital energy and resistance than the first and second, — with more or less of a cachectic appearance, or of a morbid condition of the circulation. The *fourth* (§ 73.) of these conditions, or that to which the term *empyema* is more strictly applicable, is generally attended by hectic of a marked character, by night perspirations, and often by various pulmonary symptoms in connection with physical signs of accumulation of fluid in the pleural cavity.

77. When we reflect upon the effects consequent upon the retention of the products of inflammation in the pleural sac, — upon the constricting action of the organised false membranes on the lung, — upon the irritation caused by the nature of the fluid effusion, and the consequent resuscitation of inflammatory action in acute or subacute states, extending more or less to the parenchyma of the lungs, — upon the influence of constitutional diathesis and taint upon the states of vascular action and adventitious productions, — and upon the numerous contingencies, intrinsic and extrinsic, moral and physical, to which the patient is exposed, we may readily infer that chronic pleuritis, if not soon remedied, must necessarily be followed by further alterations, not only of the adventitious formations, and of the consistent and fluid deposits in the pleural cavity, but also of the lungs, bronchi, pericardium, and parietes of the chest. These successive alterations all tend to impede absorption, and thereby to perpetuate the disease; and are the most important lesions which *complicate* the advanced course of the more unfavourable cases of chronic pleurisy. Nevertheless, absorption does take place in many instances — sometimes even in prolonged cases, especially when vital power and resistance are tolerably maintained, and when the consecutive lesions, or *complications*, about to be noticed are not developed.

78. *C. Signs of absorption of the Effusion.* — (*a.*) Many of the cases of acute and sub-acute pleurisy recover without contraction of the side or depression of the shoulder, such as will be noticed hereafter; but, in these cases, the effusion is more or less rapidly absorbed. It is, however, comparatively rare for the fluid to be removed, in the more chronic cases, without these changes in the appearance of the affected side being observed. When the lung is bound down or constricted by the false membranes, as stated above (§ 71.), or when it is so condensed by long-continued pressure, or by the extension of inflammation to its parenchyma, as no longer to be capable of expansion, the removal of the fluid accumulation by absorption necessarily occasions, owing to the atmospheric pressure, more or less contraction of the affected side, which, instead of being enlarged beyond the size of the healthy side, now gradually becomes smaller — sometimes very remarkably smaller, than that side. The contraction appears at first in the upper part of the chest; the shoulder being depressed, and, with the whole side, much more fixed than the sound side, which presents the full development and active motions of respiration. As the diseased side contracts, the ribs approach closer together, and sink lower; the scapula is more prominent, and nearer the spine; and the sternum and spinal column are somewhat curved, so as to be concave on this side. Whilst the upper parietes of the

diseased side are thus pressed inwards, the lower walls are similarly affected; the diaphragm is carried upwards, and with it the liver, or the stomach and spleen, according as either side is affected. In cases where the absorption has proceeded far, or has taken place long previously, more especially in children and young persons, the healthy lung becomes so expanded or developed from its augmented function as to press the mediastinum over into the affected side, and thus even to prevent a still greater contraction of the side from occurring. Cases are not very rarely seen in which the heart has been thus pushed either to the right side, or drawn upwards to the left, owing to the two causes of absorption of the effusion in the side towards which the heart and mediastinum are drawn, and of expansion of the lung in the sound side. In cases of this kind, the displacement, instead of being the result of liquid effusion, or of a collection of air or gas pushing these parts to the sound side, is caused by the removal of fluid from the affected side, in the manner now pointed out. In a few instances, as remarked by Dr. STOKES, the contraction is confined chiefly to the lower portion of the side, the shoulder not being materially depressed. In these instances, occurring in young persons, in which the sound lung becomes much expanded, the deformity often is much diminished in process of time.

79. M. LAENNEC has insisted strongly on this termination being most frequent after what he terms the *hæmorrhagic pleurisy*, or that state of acute pleurisy in which the fluid effusion is very great, and more or less tinged with blood-globules, and which often becomes chronic owing to the slow removal of the fluid. Although contraction of the chest is most apt to accompany the cure of the most severe cases, or those in which the effusion has been the greatest or most prolonged, yet it is by no means confined, as LAENNEC supposed, to those cases which he denominated hæmorrhagic, or even most frequently consequent upon these; for, as Dr. FORBES has remarked, it is a common consequence of the removal of all fluid effusions of considerable duration, and of purulent collections in the pleural cavity; "and, if other evidence were wanting, we have it in the analogous contraction in chronic pneumonia and phthisis."

80. In some instances the contraction consists chiefly of a flattening of the anterior portion of the side, causing more deformity than diminution of size. In others, the affected side approaches somewhat to a triangular form, "the base of the triangle corresponding to the mesial line, and the apex to the centres of the ribs." One of the first signs of absorption with contraction is the increased prominence of the inferior angle of the scapula. Dr. STOKES thinks it likely that the paralysis of the intercostals and diaphragm, which he believes to accompany pleurisy, has an immediate effect in producing the subsequent contraction, by preventing the expansion of the side.

81. The condition of the side of the chest changing thus from that of dilatation, consequent upon the effusion, to that of contraction caused by the removal of the fluid, it may be supposed that the transition from the one to the other will not be indicated by the form of the chest; and this is really the case in some instances, although in the majority the transition is not uniform, but partial. More frequently the contraction commences at the upper part of the thorax before the dilatation and displacement have entirely disappeared at the lower. An irregularity of the shape of the affected side is hence often observed during the removal of the effusion by absorption, the upper parts being unusually contracted or depressed, whilst the lower are more or less bulged or dilated. This appearance assists in the diagnosis between consolidation of the lung and progressive absorption of a pleuritic effusion, for which this latter may be mistaken.

82. But the effusion into the pleural cavity may not be to the extent of filling this cavity; it may be partial only, or limited by adhesions and false membranes, as above described (§ 52.). In these cases of partial adhesions, the walls of the chest cannot so contract as to accommodate themselves to the vacuities caused by the removal of the fluid. Sometimes slight or irregular contractions may take place; but the spaces are chiefly occupied by a partial rising of the diaphragm, and expansion of the healthy lung on both sides; and most frequently a portion of the more consistent or albuminous contents of the effused fluid still remain, presenting a curdy or semi-solid state, which is probably ultimately removed when the patient permanently recovers.

83. *b. The auscultatory signs* furnished by a side contracting after chronic pleurisy are of importance, inasmuch as during the progress of the contraction the disease may be mistaken for chronic pneumonia, or consolidation of the lung, or for tubercular disease of this organ, or even for enlargement of the liver. In many cases, especially when the effusion has been copious and of long duration, the sounds of respiration and percussion continue permanently imperfect, even although the fluid may be completely removed, and they are universally more or less impaired for months after the attack. They thus correspond with the diminished motion of the affected side, and are owing to the same lesions. Dr. WILLIAMS correctly states that an improvement is generally indicated first in the upper part of the chest, and near the spine. With the return of a weak respiratory murmur, and slight resonance on percussion, some degree of vocal resonance may also accompany the removal of the fluid in the upper parts of the chest, "amounting to loud bronchophony, often accompanied with a remarkable *buzz*; in other parts being merely the diffused vocal fremitus, according to the size of the bronchial tubes, and the degree and permanency of their compression." In some cases of this kind some of the physical signs may mislead, if attention be not paid to all these signs, and to the history of the case; for, as remarked by Dr. STOKES and Dr. WILLIAMS, if at the first time we see a patient with the above signs, and he happen to have bronchitis, we may be induced to believe that the resonance of the voice and the dulness are caused by consolidation from recent inflammation of the lung, or from tubercles; but this error will be prevented by attending to the history of the case and the appearances of contraction. The dulness on percussion of the contracting side is owing both to the falling inwards of the

thoracic parietes and to the absence of air in the compressed lung. The physical conditions of the lung and of the walls of the chest are much changed in this state of the disease; for both, especially the former, owing to the loss of their resiliency—the lung being constricted by false membranes, and compressed by the effusion, and thereby in great measure deprived of air; and the parietes of the thorax being insufficiently antagonised against the pressure from without by the much-diminished supply of air to the lung—are incapable of furnishing not only the usual sounds on percussion, but also the true indications of their existing states, unless by a strong pressure of the fingers which are the media of percussion against the walls of the chest, and by varying the force, direction, &c. of the stroke.

84. Recovery from chronic pleurisy, with contraction of the chest, is more or less complete according to the reduction that has been made in the size and functions of the lung by the previous lesions. The recovery is rarely so complete in persons advanced in life as in the young. In children, placed otherwise in favourable circumstances, and in young persons, recovery is often not only complete, but little or no inconvenience is caused by the contraction, which sometimes diminishes, especially in growing persons, owing to the increased development of the healthy lung. Some individuals, who have their sides contracted from the state of the disease, have continued to enjoy good health, and to pursue active occupations. LAENNEC has alluded to a distinguished surgeon in Paris, who had his side remarkably contracted by pleurisy in his youth, and yet enjoyed excellent health, and was in the habit of lecturing twice a day without inconvenience. In most instances thus occurring in young subjects the contraction is not excessive, and the respiratory murmur is not altogether abolished: But in a greater number of cases, particularly those occurring in advanced life, contraction of the chest occasions such an habitual shortness of breath and tendency to palpitation as to incapacitate the subject of it from active exertion. Persons thus circumstanced also experience distressing dyspnœa, and otherwise suffer most severely from slight bronchial attacks, from catarrh, and febrile affections. Dr. WILLIAMS very justly remarks, that before the system becomes accommodated to the abridgment of respiration which this lesion produces, and even afterwards, under unfavourable circumstances, there is an enfeebled or cachectic state of the whole frame, in which various trains of disorder may arise; and unless care be taken to counteract them by the means most favourable to the general health, scrofulous or dropsical disorders may be engendered, and develope new mischief in the respiratory organs or elsewhere. Although, therefore, contraction of the side of the chest may be viewed as a mode in which pleurisy may be cured, "it is one of the least favourable kind, and liable to many detracting circumstances."

85. *D. Empyema.*—In those cases, in which the effusion is not removed by absorption, or in which the morbid secretion or effusion equals or preponderates over absorption, the accumulated fluid is productive of changes ultimately of a fatal tendency, if it be not evacuated either by a spontaneous perforation of the pleura, or by an operation. The persistence and character of the accumulated fluid are to be ascribed rather to the continued inflammation and change of structure of the pleura than to any other cause. The nature of the matter effused, its purulent character more especially, also favours the accumulation or impedes absorption. Something also may be imputed to a congested state of the lung, to tubercular infiltration, or to consolidation of its structure. When the circulation through the heart or blood-vessels is obstructed, the cause of increasing fluid accumulation is more manifest.

86. *a. The signs and symptoms of empyema* are nearly the same as those already described in connection with very copious liquid effusion into the pleural cavity (§ 26. *et seq.*). In this, however, the more chronic state of disease, the accumulation of fluid, proceeding more slowly, generally is greater, and is attended by a more marked displacement of the walls of the chest, and of the viscera more immediately adjoining them. Although the more urgent symptoms have in great measure subsided, particularly fever, dyspnœa, and pain, yet the enlargement of the side, and the displacement of the parietes, are often the more remarkable. The slow increase of the accumulation, the prolonged pressure, and probably, as Dr. STOKES contends, the paralysed state of the muscles bounding the effusion, favours the greater amount of fluid collection in this class of cases than in most others. The duration of the disease, the side which is affected (more frequently the left), the nature of the associations or complications, and the temperament and diathesis of the patient, modify both the extent and the phenomena of the accumulation, more especially the extent of enlargement of the side and visceral displacement. There is no certain indication usually furnished of the purulent nature of the fluid. When rigors or chills recur, with hectic, a soft open pulse, perspirations, or even when these last are very prominent, there is great probability of the fluid being purulent; but these symptoms may be either but slight or nearly wanting. Protrusion of the intercostal muscles is considered by Dr. STOKES and Dr. H. ROE as more especially diagnostic of a purulent state of the secretion.

87. *b.* When the fluid is purulent, *ulceration* and *perforation* may ultimately attack the pleura at some point, and permit the fluid to be evacuated in a direction, according to the seat of the ulceration—either through the lungs, the walls of the chest, or the diaphragm; causing parts through which the evacuation takes place to be involved and more or less affected. Generally the perforation of the pleura is consequent upon excavations in the layer of organised or semi-organised lymph coating this membrane; and sometimes death occurs before the perforation has become complete, or even proceeded further than this false membrane. When, however, the pleura is perforated, the structures external to the ulcerated point in the pleura also become inflamed and ulcerated, and the accumulated matter makes its way in the direction of the ulceration, often burrowing between muscles or tendons, and even causing caries of the adjoining bones, as the vertebræ, ribs, or sternum.

88. LAENNEC and HASSE considered the perforation of the pulmonary pleura and discharge of the

practised in India during many years, to see a lady, aged about fifty, who was the subject of a most acute attack of hepatitis, to which rapidly succeeded dry pleuritis and pneumonia of the right side. In this very remarkable case, the symptoms and signs of hepatitis, of diaphragmitis, of diaphragmatic pleurisy, and of pneumonia with rusty expectorations, were distinctly recognised by Mr. Sims and myself. The patient recovered, and is now quite well.

99. *g.* Pleurisy may also be consecutive of, and complicated with, *peritonitis*, especially partial peritonitis of either of the superior abdominal regions. I have seen several instances of acute asthenic pleurisy, with abundant sero-albuminous or sero-sanguineous effusion, complicating the several varieties of puerperal fever, and puerperal peritonitis and phlebitis; but, in these complications, the pleurisy was generally latent, death having taken place before obvious dilatation of the side or displacement of organs occurred: indeed, in most of these cases, the pleuritic complication was double, although the fluid effusion and other lesions were much greater in one side than in the other; the amount of effusion in either side not being so great as to compress the lung in a remarkable manner.

100. I was lately called to a gentleman who had just arrived from the Azores with ascites, consequent upon repeated attacks of *peritonitis*; pleurisy, with effusion, having also supervened, and proved the more immediate cause of death. Upon examination, the appearances described in the article PERITONEUM (§§ 88. *et seq.*) were found, the adhesions being numerous, very long and thick, and the serous effusion very abundant. Some of these adhesions were round, as large as the first or second finger, with serous or polished surfaces, and formed cylinders, the external layers of which were organised and dense, and two or three lines in thickness, the interiors being loose and cellular, yet containing very much fatty matter, or rather consisting almost entirely of adipose tissue. A turbid serum was found in considerable quantity in the left thoracic cavity, in smaller quantity in the right, and adhesions, cylindrical or nearly so, stretched through the effused fluid, from the pulmonary to the diaphragmatic and costal pleura, in several places, and presented similar appearances to those in the peritoneal cavity; the thicker and the more cylindrical adhesions having organised serous surfaces, and cellulo-adipose centres; but the adipose matter was not so abundant in them as in the peritoneal adhesions.

101. *h.* In most of the complications above mentioned, the pleuritic inflammation is secondary, or consecutive of that with which it is complicated, unless in some cases of pericarditis. But in the course of many cases of chronic pleurisy, or empyema, complications may occur, and render still more dangerous, or even fatal, this already dangerous disease. This is more particularly the case when the fluid accumulation in the pleural cavity is of a purulent kind. In these especially various alterations take place in the surrounding structures, caused both by the nature of the accumulated fluid and by the mechanical influence of it. The substance of the lungs, the bronchi, the pericardium and the mediastinum, are either more or less implicated by the early stages of the pleuritic inflammation, or are consecutively irritated, inflamed, or otherwise changed by the nature and quantity of the effusion. Consolidation or atrophy of the lung often results; chronic pericarditis with adhesions to the heart sometimes takes place; the bronchi undergo various changes, and are often inflamed; the vessels of the lungs are altered, pulmonary phlebitis even occasionally supervening; and the vertebræ, or even the ribs sometimes becoming caries. In addition to these effects the actions of the heart and large vessels are impeded or disordered; whilst the blood becomes morbid, owing to the greatly impaired function of the lungs, and all the vital actions consequently languish.

102. IV. PLEURISY IN THE DARK RACES.—Pleurisy is very often met with in the Negro and other dark races, particularly when they pass into high latitudes and cold regions; and in these circumstances it is very frequently associated with pneumonia, tubercular consumption, bronchitis, &c. *Acute pleurisy* in these races is frequently latent, most commonly presents asthenic characters, and is generally attended by copious serous, sero-sanguineous, or puriform effusion. Hence, unless the shortness of breathing, acceleration of pulse, short cough, and debility with rapid exhaustion after slight exertion, usually attending the early stages of the disease in these varieties of the species, attract due attention, acute pleurisy will rapidly pass to its ultimate period, or may terminate fatally before its existance is ascertained.—*Chronic pleurisy* is also frequent in these races, especially when they migrate to colder than their native climates. It often then assumes the purulent form, and is generally complicated with pulmonary tubercles. Pleurisy both in acute and chronic states, frequently with effusion in the former state, and often with adhesions in the latter, is not an unusual complication of pulmonary tubercles in the dark races, especially after change of climate and exposure to cold,—and is very commonly either latent or masked by the symptoms caused by the bronchitic complication which is also frequently present.

103. V. PLEURISY IN INFANTS AND CHILDREN.—Pleurisy is met with in children of all *ages*; but it is most frequently seen, especially in an uncomplicated form, in children upwards of five years of age. Before that epoch, it is rarely unassociated with pneumonia, and even also with bronchitis; pleuro-pneumonia being the most common state of disease. In children, as well as in adults, pleurisy is much more frequent in male than in female children. In this class of subjects it is frequently consecutive of pneumonia, and of eruptive fevers, either as a complication of those fevers, or as a sequela of them during some period of convalescence. Indeed there is a remarkable disposition to the supervention of pleurisy, or of pleuro-pneumonia, during the whole period of convalescence from these fevers, more especially until the healthy functions of the skin are entirely restored. In other respects the *causes* of the disease in children are the same as those of adults; but, as shown when remarking on the prevalence of *pneumonia in children* (see LUNGS, INFLAMMATION of, §§ 122. *et seq.*), these causes act more injuriously, and their effects, whether in the form of pneumonia, of pleurisy, or of pleuro-pneumonia, are the more to be dreaded the

when he will not fail of detecting it.—*a.* Pleurisy in any form, but more especially in the acute, is often associated with *inflammation of the substance of the lung*, forming *pleuro-pneumonia*, described in the article LUNGS (§§ 73—75.), or *pleuro-pneumonitis*, *peripneumonia*, or *peripneumony*, of various writers. It is unnecessary for me to notice this complication further at this place, than to add, that the inflammation, in these cases, most commonly assumes a sthenic character, although the asthenic state is occasionally also met with; and that, although both diseases, or rather the inflammation of the two different structures, may be coëtaneous as well as coexistent, yet the pleuritic is more frequently consecutive of the pulmonic affection, than the pulmonic is of the pleuritic. This may be owing, in great part, to the nature of the tissues, and of the connection existing between them; but it is more probably owing to the general tendency of inflammations of parenchymatous organs to extend to the periphery.

94. *b.* Pleurisy, either in a simple form, or associated with pneumonia or with bronchitis, is one of the most important complications of *exanthematous* and *continued fevers*. When it is the complication or associated local affection in these constitutional maladies, it is always acute, unless when it appears in the course of convalescence from either of them; and it presents the same characters or diathesis, in respect of vascular action and vital power, as these possess; but the *asthenic*, in its various grades, is the most common, especially if it supervene at an advanced period of the fever, when the vital energy is depressed or exhausted, and when the circulating fluids are morbid or contaminated. Whenever the breathing is very short and frequent, with or without cough or pain in the side or chest, in these diseases, then this complication should be suspected, and a careful examination be immediately instituted, as the progress of the local mischief is generally rapid when it occurs in the course either of these, or other constitutional maladies.

95. *c.* Pleurisy, generally of an adhesive form, and of chronic duration, very frequently accompanies *tubercular consumption*, and chronic *tubercular pneumonia*. This pleurisy is generally the consequence of the irritation or chronic inflammatory action occasioned by the tubercular deposits in the lungs, especially when these exist near the surface, or when the tubercles soften in that situation, and are followed by cavities. In these cases the pulmonary pleura becomes implicated in the inflammatory action in the immediate vicinity, throws out lymph on its free surface, which excites a corresponding morbid action in the opposite part of the costal pleura, and forms close and firm adhesions between the lung and walls of the chest. This state of chronic or subacute pleurisy is most frequently observed near the summits of the lungs or upper regions of the thorax; is most commonly attended by adhesions, without fluid effusion; or, if such effusion occur, it is soon absorbed (see §120.). In some cases, however, tubercles soften, and cavities form, near the surface of the lung, and perforate the pulmonary pleura at the nearest point to them, without giving rise to adhesion to the opposite surface. In these, fluid effusion often takes place before the perforation is completed, and air passes into the pleural cavity, giving rise to the lesion denominated *pneumathorax*, which is fully considered in another place. The association of pleurisy with tubercular consumption is more fully considered in the article on this latter malady.

96. *d.* Pleurisy is sometimes complicated with *pericarditis*. Generally the pericarditis is of the dry form, in which it has been remarked in several instances by Dr. STOKES. In two cases, to which I was called shortly before death, the previous history of which was not precise, but which were considered and treated as very acute cases of pleuro-pneumonia, the *post mortem* examination disclosed the association of pleurisy with pneumonia and pericarditis. In both these cases there were considerable effusion, with shreds and pieces of lymph, into the left pleural cavity and pericardium, the diaphragmatic pleura being much affected. Dr. STOKES remarks, that where the pericarditis is of the dry form, the symptoms are not so violent as in that with effusion. He has observed this complication in cases of acute pleuritis, and in two instances of very chronic empyema. In the latter cases, the usual symptoms of pericarditis were altogether wanting; and no new suffering marked the invasion of the disease, which was discovered only by auscultation. The observations of M. BROUSSAIS apply chiefly to cases of this complication, with copious effusion into the pericardium; in which there are generally pains in the præcordia, with great anxiety and want of sleep. The patient sits bending forwards, with his head resting on his knees; and yet, notwithstanding great concentration of the pulse, there is a tendency to fainting, and almost complete absence of fever. (*Traité des Phlegmasiæ Chroniques*, t. i.)

97. *e.* Although pleurisy is more frequently *caused by*, than *associated with*, *acute rheumatism*, still this complication is occasionally observed; the still further complication with endocarditis or pericarditis being also met with in rare instances. This very complicated state of disease has been seen by me in children, between eight and thirteen years of age, in three cases, in all of which it was recognised during life, and ascertained by inspection after death.

98. *f.* The complication of *hepatitis*, especially of inflammation of the convex surface of the liver, with pleurisy, is by no means infrequent, and supervenes chiefly in the course of the acute form of hepatitis. It occurs also in the chronic form, especially when an abscess of the liver is passing through the diaphragm, either into the pleural cavity, or into the lungs and bronchi, adhesions having been formed between the opposite surfaces of the pleura. This form of the complication is noticed in the article on the diseases of the LIVER (§§ 141—145.); but I have seen cases of chronic hepatitis, not connected with abscess, that have been associated with empyema of the left side, the heart being pushed over towards the right side. I am at this time attending a female, in Brook Street, aged between thirty and forty, who, according to the history of the case furnished me, appears to have been attacked by sub-acute hepatitis, attended by suppression of the menses, and followed by ascites, and by chronic pleurisy of the left side, with effusion, displacement of the heart, and dilatation of the thoracic parietes. I was recently requested, by Mr. SIMS, a surgeon who had

practised in India during many years, to see a lady, aged about fifty, who was the subject of a most acute attack of hepatitis, to which rapidly succeeded dry pleuritic and pneumonia of the right side. In this very remarkable case, the symptoms and signs of hepatitis, of diaphragmitis, of diaphragmatic pleurisy, and of pneumonia with rusty expectorations, were distinctly recognised by Mr. Sims and myself. The patient recovered, and is now quite well.

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younger the child which becomes the subject of them.

104. Pleurisy in children is most frequently single, as in adults. MM. RILLIET and BARTHEZ state that, in the uncomplicated state, pleurisy is somewhat more frequent in the right than in the left side; whilst the complicated states occur more frequently in the left. This, however, does not agree with my experience; as I have found, in children as well as in adults, pleurisy in every form more frequent in the left than in the right side of the chest. As to the products of inflammation of the pleura, false membranes, and serum more or less turbid, are most commonly observed in this class of patients, and the false membranes are most extensive and most generally found in the pulmonary pleura, and least abundant and frequent on the diaphragmatic pleura.

105. The accession of pleurisy is not always attended by rigors or chills, especially in young children—never in infants; and the *decubitus* in them especially, is not much different from the usual. Sometimes decubitus on the back, with the shoulders raised, is preferred. In young children and infants especially, when associated with pneumonia, as pleurisy usually is, little or no fluid accumulates in the pleural cavity, although lymph is thrown out. The infant is restless, cries constantly, especially when moved or held erect; the skin is hot and dry; and the rubbing or creaking sound is heard on auscultation; the respiratory movements of the affected side being diminished. During the acute or early stage of the disease, in older children effusion, although abundant, seldom causes dilatation of the side: this symptom is rarely observed until the disease has become chronic, and then it is often remarkable and attended by paller, enervation, debility, night perspirations, and loss of appetite. If the fluid be not absorbed or evacuated by an operation, death ensues, after one, two or more months, the patient being in a state of complete marasmus. In the case of a young relative of my own, pleurisy, followed by empyema of the right side, occurred at the age of eight years, and the matter was evacuated externally by a fistulous opening as described above (§ 89.) He perfectly recovered; and the functions of the lung and the size of the side are now natural.

106. The *complications* of pleurisy are most to be dreaded in children; more especially when pleurisy occurs in the course of eruptive fevers, or of pneumonia or hooping-cough. In very young children, and in infants, this disease, whether simple or complicated, and more particularly when associated with pneumonia or bronchitis, or when developed in the course of hooping-cough, is very frequently fatal; and in infants it may terminate fatally, by causing suffocation in twenty-four hours. In older children, especially when uncomplicated, pleurisy even in the more acute forms, is much more disposed to assume a chronic form than in the very young, in whom the more prolonged states of the disease are rarely seen.

107. VI. THE STATE OF THE BLOOD IN PLEURISY has recently received attention; but more as regards its chemical constitution, than as respects its sensible appearances. Formerly, and with much better reason, these appearances attracted the chief, and indeed no small attention; for they furnish very important information as to the states of vital power and of vascular action characterising the disease at the time when the blood is abstracted; and they moreover aid the physician in forming his diagnosis—still more in giving his prognosis—but most of all in determining his indications of cure, and in selecting the means of fulfilling them. Yet this important source of information is neglected, and the particular mode of studying the conditions of the blood in disease that actually furnishes the smallest amount of useful information to the practical physician is that which now attracts attention, although this very small amount cannot possibly be ascertained by the practitioner at the only time when it can prove in any way advantageous, whilst it causes the neglect of that knowledge which instantly furnishes the most important pathological and therapeutical indications.

108. *A.* The *appearances* of the blood, especially of the coagulum, vary remarkably in pleurisy, according to the states of vital power and vascular action.—*a.* In the *Sthenic acute form* of the disease, the blood taken from a vein generally presents the buffy coat and a firm coagulum, the quantity of fibrine being generally about double the proportion observed in health. If the first bleeding has been early in the disease, the blood will generally present a firm and rather large coagulum, but frequently be neither cupped nor buffed, or but slightly so, although a second venæsection, performed only a few hours afterwards, will present these appearances in a high degree, a third depletion also presenting them, but in slighter grades. However, nothing can with certainty be affirmed as to the effects of a second or third depletion, as much will depend upon the quantity of blood taken away relatively to vascular fulness and action, and to the powers of the constitution; but commonly the proportion of the coagulum to the serum, or of blood-corpuscles becomes diminished, whilst the fibrine may be increased in the second blood-letting, but diminished in a third and fourth. In these cases, as well as in pneumonia and acute rheumatism, the quantity of fibrine is generally great in proportion to the degree of fever, pain, and sthenic action, whilst the blood corpuscles, or hæmato-globulin, is diminished with the quantity of blood taken away. In fat persons, especially, the serum often assumes a whitish or milky hue after repeated venæsection, owing to the fat absorbed and conveyed into the blood. (See Art. BLOOD, §§ 84. 96—108.)

109. *b.* In the *asthenic, cachetic,* and *latent states,* as well as in most instances of chronic pleurisy, the appearances of the blood are still more various than in the sthenic form: but in many instances they furnish important indications of cure. When vital depression is very remarkable, and vascular tone impaired or exhausted, the coagulum is either soft or the blood coagulates imperfectly, although the quantity of fibrine may be greater than in health; and a large soft coagulum is often imperfectly separated from the serum. In many of these cases the blood presents much of the appearance described in the article BLOOD (§ 94.); but I have so rarely seen blood taken from a vein in these states of the disease, that I am unable to add more from my own observation, as to the appearances of the blood in these circumstances.

110. *B. Analyses* of the blood in pleurisy have been made by ANDRAL and GAVARRET, who found that the quantity of fibrine was increased to very much more than double the natural quantity; and that the increase was greatest in the most acute and most febrile and painful cases, and was the least in the chronic and non-febrile. BECQUEREL and RODIER analysed the blood of five men attacked with acute pleurisy, and found the fibrine much more than double the healthy proportion, whilst the albumen and blood corpuscles were somewhat diminished; but the results of the observations of the physicians above mentioned are in no way precise, nor are the changes very remarkable, excepting only as respects the quantity of fibrine; the proportions of the several constituents of the blood depending much upon habit of body, sex, and constitution of the patient; upon the state, grade, and form of the disease; upon the states of febrile action and vital power; upon the stage of the malady, and the quantity of blood previously abstracted. Let the candid and practical reader peruse the accounts of numerous analyses of the blood made by German and French chemists and pathologists, especially those made with a view of showing the composition of it in pneumonia, pleurisy, rheumatism, erysipelas, &c., and he will find, according to the summaries of these analyses given in SIMON's Animal Chemistry applied to Physiology and Pathology, with the additions by Dr. DAY, the very slight differences, or even the sameness, of the results, as regards these and some other diseases. Having obtained the full amount of knowledge he possibly can derive from these sources, let him next endeavour to apply it to practical purposes; and if he can do so, with only one-tenth of the advantage which may be derived from attention paid to, and an acquaintance with, the sensible appearances and properties of the blood, he will be much more fortunate than I can credit.

111. It is very justly remarked by VOGEL, that it is very difficult—indeed impossible—to draw any certain conclusions from the statements of the above-mentioned and other observers, respecting the changes of the several constituents of the blood, or the causes of these changes. In fact, our whole knowledge of the chemical constitution of the blood in both health and disease is most unsatisfactory, and the statements of different writers vary so widely, that it is impossible to deduce any general laws from them. And I may add to this opinion of this able pathologist, that writers on the chemical constitution of the blood in disease have shown only how very little information they are able to give upon the subject; and that little evinces its insufficiency even for the purposes of either a theory or a hypothesis, and its almost total inapplicability to any practical purpose. It is, therefore, to the old fashion of observing the sensible changes and states of the blood, and of connecting these changes with the states of vital power and of vascular action upon which they manifestly depend, that we must recur with any hopes, in the present state of our knowledge, of practical advantage.

112. VII. THE PATHOLOGICAL ANATOMY OF PLEURISY.—*A.* The earliest appearances of inflammation of the pleura are similar to those which I have described as being observed in inflammation of the PERITONEUM (§ 81. *et seq.*), and consist of a congested state of the capillaries, which are congregated, here and there, beneath the still transparent membrane. The red colour produced by these vessels, at certain points, deepens and becomes more diffused. These points are somewhat prominent, and, although scattered and distinct at first, they soon enlarge and coalesce. Patches and streaks are also observed, either darker than the rest, resembling small ecchymoses, or of a pale red hue, as if from imbibition. The pleura now becomes dull, and loses its polish and smoothness. The redness spreads and becomes more and more uniform. Soon afterwards the rudiments of adventitious membrane may be perceived. The spots originally reddened by repletion of the capillaries, present little, dull, whitish or yellowish points, which rise above the surface in the form of flat granules, and ultimately coalesce. The pleura, as HENLÉ has shown, consists of several layers of superimposed cellular tissue, more and more closely attached to each other, the free surface being a thin layer of epithelium cells. Blood-vessels penetrate all these layers, excepting the exceedingly delicate epithelium membrane formed by these cells. The inflammation therefore is not seated, or does not commence, in the epithelium membrane, but in the subjacent cellular layers; this epithelium being thrown off at an early period of the disease. Whilst these changes are proceeding in the pleura, the layers of cellular tissue connecting the pleura to the subjacent parts are more than usually vascular, and are more or less infiltrated with a yellowish, semi-gelatinous fluid; but this implication of the external cellular tissue is only occasional, or exists chiefly at the commencement, and is removed as effusion or other advanced changes take place. In rare instances only are alterations of the pleura and of the subjacent cellular structure observed to proceed, *pari passu*, with each other, more particularly as regards the costal pleura.

113. Consequent upon the changes now described, especially upon the greyish or yellowish points mentioned above, which are the initial and expanding rudiments of the consistent or membranous effusion, a slight, sometimes a much more abundant exudation of serum is also observed. When the progress of the inflammation is soon arrested these products are inconsiderable; but more frequently, and when the disease proceeds but little further, the pleura is found as far as the inflammatory injection extends, to be lined by a very thin layer of plastic exudation, forming a delicate membrane, mostly opaque, which veils the inflammatory redness underneath it. The liquid effusion contained in the pleural cavity consists of a small quantity of a yellowish limpid fluid, or of a more abundant collection of a turbid, or of a reddish or mahogany-coloured serum, containing delicate flocculi. HASSE supposes that upon the condition of the thin adventitious membrane covering the pleura depends the length of time requisite for the absorption of the fluid; and that the more heterogeneous the quality of the former, the greater will be the impediment to the absorbents acting upon the latter. However, there are other circumstances besides the state of this membrane, which will either impede or accelerate absorption of the contained fluid, and it can hardly oppose any great obstacle, as it either

enters into organic union with the serous tissue, or else it is gradually dissolved in the fluid.

114. When the inflammation either continues unabated, or steadily, and gradually, or more or less rapidly encreases, the morbid products accumulate in proportion, exhibiting at the same time the most manifold differences. These differences depend more or less upon diathesis or peculiarity of constitution and temperament, upon the grade of inflammation, upon its character and the degree of tone or of vital power attending it, and upon the state of the blood itself. The German and French pathologists, more especially HASSE and ANDRAL, whilst they describe these differences with much precision, take insufficient note of the several pathogenic conditions upon which they certainly depend more or less; although it is very difficult to assign these differences or states of the inflammatory products in this disease to any one or more states of the system or of the circulating fluids, inasmuch as these products evidently undergo various changes after their accumulation and during their retention, and, moreover, the states of vital power, of inflammatory action, and of the blood attending their exudation and collection, soon change and become very different when they are retained for some time; these states being rather the consequences of the accumulation and retention of these products, and of the changes these products have undergone, than the causes of the differences or peculiarities they present when they become the objects of examination. To say, therefore, that variety of character in the products of inflammation of the pleura "is entirely founded on individuality," as some pathologists have contended, is to confess ignorance under the mask of a term. That the varieties observed are chiefly to be referred to the states just enumerated will be confirmed by more close and precise observation, although the difficulties of ascertaining the dependence of certain alterations upon determinate states of vital action, whilst the products of these states cannot be immediately examined, I am still disposed to believe. The exact appropriation of the several varieties of these products to the pathogenic states which produce them can hardly be expected, seeing that both the causes and the effects are the subjects of continual change; but an approach to it may be made sufficiently close for all practical and useful purposes.

115. *a*. The product of pleurisy, most simple, and most frequently observed, is a transparent yellowish jelly or lymph, and which is effused with great rapidity and in considerable quantity when the inflammation is intense. It is partly diffused in layers between the pulmonary and costal pleura, and partly subsides to the lowest part of the pleural sac in pellets or flakes surrounded by a small portion of fluid. This gelatinous exudation or lymph consists almost exclusively, and often in nearly equal proportion of the fibrine and serum of the blood, the latter most frequently predominating, with a very little colouring matter, attracted here and there to the inflamed surface. It is *susceptible of organisation throughout*, and blood-vessels form in it with surprising rapidity. HASSE met with a case in which plueritic pains occurred twenty hours before death, and found, at the corresponding part, this gelatinous lymph, in which delicate vessels were observed shooting from the borders. This product soon adheres to the surfaces of the pleura where they approach each other, and a very few days suffice to produce an extensive cohesion between the two. The rapid growth of vessels gradually confirms the union, and the aqueous portions of the effusion soon being absorbed, the formerly separate surfaces now adhere by means of a soft vascular and cellular layer or false membrane. The disease often terminates thus favourably, without the function of the affected part being materially or permanently disturbed. But the inflammation, having given rise to these changes, either partially or fully, and being nearly extinguished, may be rekindled, and the incipient adhesions may be stretched, or torn away, or even dissolved by the fluid poured out during the consecutive attack, and various other changes produced in the products previously formed, as well as other more novel deposits may take place.

116. *b*. The pleuritic exudation or lymph is not always of this organisable kind, or so germane to the organism, owing to a depraved habit of body, to the state of vital power, and most probably also to the condition of the blood. Without, however, ascribing the difference to these states, Professor HASSE believes that ingredients very often enter into the composition of the pleuritic effusion which, either form too early consolidation, or, from some peculiarity of character, render it less susceptible of consolidation. These substances he considers as being far less easy of assimilation, and, acting as foreign bodies, serve to embarrass the surrounding parts. Adventitious membranes of this kind, and which are only *conditionally susceptible of organisation*, appear not to form so rapidly as those just described. They generally consist of several either homogeneous, or else distinctly different layers, largely investing and firmly adhering to the pleura. Their consistence resembles that of a hard-boiled white of egg. They tear easily, and present when torn a fibrous-like texture. The colour of these plastic or albuminous masses is mostly of a yellowish or dull white; but they occasionally vary greatly, passing to a faint red, or into a violet or mahogany tint. The tinge is sometimes equable, but is also occasionally irregular, or patched, or streaked, or different in the layers or surfaces. These membranes are always opaque: their free surface is usually paler and softer than that adhering to the pleura, and is usually villous or reticulated. The cavity of the pleura contains, in addition to this false membrane, a considerable quantity of a slightly turbid or flocculent fluid, or a light brown or reddish liquid, bearing some relation to the quantity and character of the false membrane. When there is a more complete development of blood-vessels in this membrane, there is also a smaller amount of fluid; and where, on the other hand, the organisation of the membrane is imperfect or arrested, or when the consistent product is merely that of an unorganised coagulum, the fluid effusion is relatively more abundant, and, as HASSE supposes, with great probability, much less likely to be absorbed. It is not unlikely that exudations of the latter kind are liable to various changes during their retention, causing further alterations in both the more consistent and more fluid parts, preventing or retarding the organisation of the

ened pleuræ, posterior to the inferior lobe of the lung." When tubercle enters into the combination, and the case does not prove rapidly fatal, it is occasionally met with as a residue of the aggregate morbid product, in small scattered portions included betwixt the pleuritic adhesions. In such cases, various consecutive changes sometimes take place, which will be noticed hereafter.

125. *l.* When the fluid, instead of being removed by absorption, makes its way out of the pleural cavity, the lung is the part most frequently perforated; and it is the superior anterior portion of the organ which is most commonly the seat of perforation. HASSE states that this does not take place where the lung has suffered compression, but where it has continued to expand, —in the majority of cases, at the inferior surface of the upper and middle lobes. Such portions are commonly attached by old adhesions to the costal pleura, and form an arch over the effusion. The effusion presses against this arch, until some point of the substance of the lungs and of the pleura softens, gives way, and allows the fluid to escape through the bronchi. The perforation may, however, take place at the inferior lobe, or at the base of the lung, especially when protected from compression by old adhesions, and remaining partially pervious to air. These perforations are rounded or oval, are smooth at their edges, and seldom exceed two or three lines in diameter. They are generally single. The parenchyma in the vicinity of the perforation or fistula is generally in a state of grey hepatization, or of complete purulent softening. This change is usually fatal; but ANDRAL and HEYFELDER have met with instances of recovery.

126. The passage of empyema through the diaphragm is very rare. ANDRAL and MOHR have adduced instances of this occurrence. In these, the fluid, after perforating the diaphragm, pushed down the peritoneum before it, thereby preventing effusion into the peritoneal sac. In one of MOHR's cases, the diaphragm was perforated near to the spine, and the pus descended behind the peritoneum, along the psoas muscle, causing abscesses and fistulous openings in the thigh, extending as low as the knee. GENDRIN mentions a case in which the fluid made its way into the anterior of the mediastinum. Escape of the effusion through the thoracic parietes, presents a better chance of escape for the patient than the foregoing. The chief cause of the spontaneous evacuation of the fluid of empyema through the bronchi and thoracic parietes being so often fatal, is the influence of the external air upon the diseased pleura and upon the walls of the fistula, especially upon the substance of the lungs. The purulent secretion soon becomes remarkably fœtid, and the air which passes into the cavity is soon deprived of its oxygen. DAVY found the air in pneumothorax to consist of 0·92 of nitrogen, and 0·08 of carbonic acid. The fluid of empyema generally evolves the odour of phosphuretted and sulphuretted hydrogen.

127. *m.* The *state of the lungs*, in cases where the pleural cavity is surcharged with effusion has been described by several modern writers. The lung of the affected side suffers the most, as may be expected: its compression being commensurate with the increase and ascent of the fluid, until it can no longer expand, and the air can scarcely enter the partially compressed bronchial tubes. When the lung is free from adhesions, it is pressed upwards and forwards, and, finally on all sides towards its roots, when the bronchi and blood-vessels penetrate. It then occupies the least possible space, in front of the vertebral column; is flattened and shrivelled; its different lobes are mostly adherent; the parenchyma is inelastic, devoid of crepitation, and almost bloodless; and generally without tubercles. When, however, tubercles are developed in the course of chronic pleurisy, or are advanced, having previously existed, a thing by no means rare, they are not found in the most compressed portions of lung. The bronchial tubes are usually found loaded with a whitish tough mucus. Where adhesions exist, these generally preserve a portion of lung more or less expanded, the bronchi then remaining partially pervious to the air; and tubercles are not unfrequently seen in the partially expanded portions of lung.

128. The mode in which compression of the lung presents itself in those cases, in which adhesion between the opposite surfaces of the pleura exist, has been described by MOHR (*op. cit.* p. 127.). Out of forty-three cases, six of which were double, the compression and displacement of the lung were once in the direction from above, downwards, — four times from behind, forwards, — four times from before, backwards, — four times from within, outwards, — thirteen times from below, upwards, — and twenty-three times from without, inwards.

129. *n.* The *appearance* and *structure* of the adhesions formed between the lung and costal pleura, and between the lobes differ: but they may be referred to two kinds: — *First*, the cellular, in which the opposite surfaces are equally united, by means of a dense cellular tissue; and, *secondly*, the filamentous or band-like, separate bridles or bands, having a smooth serous surface, passing between the two pleural surfaces. These bands appear identical with the serous membrane, whose product they are, and into which they directly pass. They are often supplied with blood-vessels of considerable size; and they consist of densely stratified cellular tissue, with an investment of epithelium cells: and they sometimes contain, as remarked by LAENNEC, HASSE, and myself, a considerable portion of fat within this texture, more especially in their centres (see above, § 100.). As shown by BECLARD, DUPUYTREN, VILLERMÉ, and others, these adhesions may remain during life without occasioning any sign of disease; but I have met with cases, in which their existence and situation have been inferred, and the inference has proved correct, as shown by dissection, years afterwards. They may even disappear in the course of time. In the latter case, the chords lengthen, become thinner in the middle, and ultimately rupture; nothing excepting a whitish, rugose thickening of the pleura remaining.

130. The adhesions following and complicating tubercular disease of the lungs are different from those observed in primary pleurisy. They commence at the apex and gradually descend, closely following the course and extension of the tubercular disease. Professor HASSE considers these adhesions as being less the result of decided inflammation, than of a chronic irritation, limited

in degree, and kept up by the proximity of the heterologous product. The result is complete blending of the pulmonary with the costal pleura, with lardaceous thickening and degeneration of the serous structure. Owing to this intimate fusion, the intercostal vessels push branches into the diseased substance of the lung. In favourable circumstances to the development of inflammation, the slight irritation, causing the insensible, or nearly insensible, adhesion of opposite portions of the pleura, may amount to actual inflammation, rapidly spreading over the pleura, and throwing out diverse products, generally with tubercular matter, and passing into chronic pleurisy. MOHR calculates the complication of pleurisy with tubercular diseases of the lungs to be fifteen cases out of twenty; and this appears to be near the truth.

131. *o.* It is comparatively rare to find pleuritic lesions simultaneously in both cavities. HASSE states that of thirty-five fatal cases, he found nine double cases; and in five of the nine one sac was implicated in a minor degree. He considers both sides of the chest to be almost equally prone to the disease, with this difference that pleurisy of the left side is both more likely to prove fatal in the acute stage, and more apt to pass into a chronic state; but he adds, of the thirty-five cases just mentioned, sixteen were of the left side, and ten of the right, the other cases being double. Of fifty-six cases observed by MOHR, the left side was the seat thirty-seven times, and the right nineteen times. The experience of Dr. H. ROE and Dr. HUGHES also shows a much greater frequency of the disease of the left, than of the right side; and the cases which I have seen, since my attention has been directed to the matter, also evince a much greater frequency of pleurisy of the left side. In 1846, I met with four cases of the disease in this side in succession.

132. MM. RILLIET and BARTHEZ state, that simple pleurisy is more frequently met with in the right, than in the left side in *children:* but that pleurisy complicated with pneumonia occurs oftener in the left; whilst the simple and complicated cases united are more frequently seen in the left than in the right. Of all the products of inflammation in this class of subjects, these physicians found that false membranes were the most frequent, and these were sometimes the only lesion; next to these was a turbid serum, a purulent fluid being the most rare.

In 85 cases, false membranes were present in 79.	In the right pleura only, 27. In the left only, 38. In the two cavities, 14.
In the 79 cases in which there were false membranes, they existed alone or with redness only, 28 times.	In the right pleura only, 14. In the left alone, 13. In both, 1.

133. VIII. THE DIAGNOSIS OF PLEURISY requires only a very brief notice, after the full descriptions which have been given above of the symptoms, signs and consequences of the disease.—*a.* The greatest difficulties as to diagnosis present themselves in cases occurring in *children*, and in *adults* when the physician has not observed the earlier stages, or when the pleurisy is latent, and the quantity of fluid effused is not great. In infants and children under four or five years pleurisy is most frequently associated with pneumonia; but, after that age, it is often primary and uncomplicated. During *infancy*, pleurisy is detected with great difficulty; but it should be dreaded when the patient is seized with violent and constant crying or screaming, restlessness, hot and dry skin, dry, short cough, and the appearance of increased suffering upon being raised to the erect posture. Upon inspection of the chest, the side affected does not move so freely as the other during respiration, and auscultation detects a rubbing or creaking sound, which usually continues longer than in adults. In very young children there are generally also signs of pneumonia, especially crepitation, associated with these, and occasionally there is evidence moreover of bronchitis. In older children pleurisy is also often complicated with pneumonia, and, in rarer instances, with pericarditis; but, in these latter, acute rheumatism is generally also present, or it has immediately preceded the thoracic complication. The chief difficulty, however, is in distinguishing pleurisy from pneumonia, and in ascertaining during life the existence of the association of the two diseases. The former usually commences in children with dry cough and acute pain, soon followed by a bronchial respiration, inspiration being attended by a metallic sound, whilst the respiratory sound is rarely much impaired, unless the disease is advanced. Change of position aggravates the symptoms. The febrile symptoms generally abate from the fourth to the seventh day; and previously the rubbing or creaking sound is often heard, especially before effusion has taken place; but this sound may also be present when the lung is implicated. In this latter case, there are generally also crepitation or sub-crepitation, accompanying bronchial respiration and mucous expectoration, which, in older children, is often copious, and even tinged with blood. When the lungs are thus also affected, the febrile symptoms are usually more severe, and continue until the 7th, 8th, or 9th day, before they abate.

134. *b.* In the earliest stage, the pain of pleurisy may be mistaken for *pleurodynia*, or nervous pain in the side; for the absence of any distinctive physical sign at this period, unless in such cases as may furnish a rubbing or cracking sound, leaves us without proof of the existence of the disease, excepting that which may be inferred from short dry cough, heat of skin, hardness or sharpness of the pulse, and other febrile symptoms, and these may be very slight, or insufficient to indicate the nature of the malady. But not only may these be so slight as to be almost wanting, unless occasionally towards evening, but pain itself may be wanting or be so situated, and so slight unless in motion or on exertion, as to render the disease entirely latent, as stated above (§ 49.), until the effusion is so considerable, as it usually is in a short time, in these cases, as to develop the physical signs (§ 24.).

135. *c.* Pleurisy may also be mistaken for *consolidation of the lung*, and this latter for it. This mistake is most likely to be made, when the pleurisy is attended by a moderate amount of effusion, the walls and contents of the chest not being displaced. This lesion of the lung generally in-

creases the vocal resonance of the affected side, whether heard or felt by the hand, and allows some sound of respiration, which is generally of a bronchial character, to be heard; and it thus may be distinguished from this state of pleurisy. "Partial pleurisies confined by adhesions," as Dr. WILLIAMS justly observes, "are less easily distinguished, because, where the lung is adherent, there may be as much bronchophony and respiration, as in cases of consolidation; but on examination, these will be found to be more circumscribed than in the latter case, all sound being absent in other parts, which further present the signs of enlargement or displacement of the heart, liver, or mediastinum, with fulness of the intercostal spaces, generally more remarkably than usual. A similar irregularity in the shape of the chest will serve to distinguish pleurisy in the progress of cure by contraction of the chest, from the case of a consolidated lung." (*Op. cit.* p. 122.) Although I admit the truthfulness of these remarks, as respects many cases, yet others will occur to which they do not apply, and in which they cannot assist the diagnosis. They apply chiefly to the more developed and well-defined cases; but to others not so characterised, and to those which are more complicated, they will furnish but slight aids. Indeed no precise statements can be offered as to the diagnosis of several states of pleurisy attended by adhesions, partial effusions, and alterations of the substance of the lungs, as none apply sufficiently to these ever varying states to mark them with precision. The physician's accuracy of diagnosis, as regards them, will depend much upon the attention with which he has watched the course of the disease, and upon his acumen in detecting, and his sagacity in comparing and estimating signs, symptoms, and almost imperceptible and evanescent phenomena.

136. *d.* Chronic pleurisy is liable to be confounded with *tuberculous disease of the lung*, for some of the signs of both maladies are somewhat similar, and the constitutional symptoms and affection are often alike. Indeed, the one may pass into the other, or both may be present. There never is, however, the same amount of dulness on percussion and absence of respiration in the latter malady as in chronic pleurisy; whilst the enlargement of the side and displacement of the viscera, attending pleurisy with very copious effusion and empyema, never exist in phthisis. The puriform state of the expectoration often observed at an advanced stage of chronic pleurisy, should not mislead the physician, for this appearance of the sputum occurs in the last stages of most diseases of the chest, and is an attendant upon a sympathetic chronic bronchitis which gradually supervenes in their advanced progress, and is independent of any actual disease of the substance of the lung.

137. *e.* Protrusion of the intercostals may be looked upon as the surest sign of *empyema;* for it rarely accompanies a very copious and non-purulent effusion in the acute stage, whilst it is generally present when the fluid is purulent, although actually smaller in quantity than before it assumed this character; this sign indicating rather the kind of fluid than the quantity, as justly insisted upon by Dr. STOKES and Dr. H. ROE. It should also be recollected, that a small effusion into the right cavity may, when the patient is examined in the sitting or standing position, be mistaken for an enlarged liver — or the rising of this organ high in the thorax, or this latter may be mistaken for the former; whilst the presence of a considerable quantity of fluid in the left side may not be detected, owing to an inflated stomach having pushed the diaphragm before or behind it, or to the small quantity of fluid interposed between the parietes and the inflated organ, admitting of a clear sound upon a strong percussion, although a dull sound may be given out by a very gentle percussion. The absence of the vibratory thrill produced by the voice, and the decubitus, generally on the affected side (§§ 30. *et seq.*), will further determine the seat of effusion.

138. At an advanced period of empyema a copious expectoration of purulent matter may occur, and may lead to the inference of the existence of a pneumonic abscess, or of a tubercular cavity, or at least of chronic bronchitis, of the uncompressed lung. Instances of this kind have been noticed by ANDRAL, STOKES, and MAC DONNELL, and upon dissection no such complication could be detected. But true pulmonic abscesses are comparatively rare, and are not accompanied with copious expectoration. The last writer just named very justly infers that purulent expectoration, in empyema, although attended by quick pulse, sweating, emaciation, and other hectic symptoms, is indicative of tubercular or pneumonic abscess, unless attended by unequivocal physical signs of these lesions; but, on the contrary, it is to be regarded as the consequence of an effort of the constitution to get rid of a large collection of purulent matter, by one of the ordinary emunctories.

139. It should, however, be kept in recollection that the lung of the sound side often experiences, in the course of empyema, congestion of the mucous membrane of its bronchi, or fully developed bronchitis, often passing into chronic bronchitis. In such cases, the accession of chills, rigors, fever, increased difficulty of breathing, with the physical signs of bronchitis, generally indicate the complication, which in various degrees is a frequent consequence of the increased determination of blood that takes place to the sound lung, owing chiefly to the compressed and impermeable state of the lung of the affected side.

140. When a circumscribed purulent collection forms on the left side and advances externally ("the *empyema of necessity*" of French pathologists (§§ 52. 56.)), it may, owing to the pulsations of the heart communicated to it, be mistaken for a thoracic aneurism, or even for a malignant tumour in that situation. MR. MAC DONNELL has pointed out this circumstance, and has published some interesting cases illustrative of this form of empyema, which he denominates "*pulsating empyema of necessity.*" It may be distinguished from *thoracic aneurism*; — (*a.*) by the history of the case; — (*b.*) by the dulness extending over the whole side, the pulsation being felt only in the external tumour; — (*c.*) by the absence of thrill, and of bellows-sound, and (*d.*) by the extent and nature of the fluctuation. It cannot be mistaken for *encephaloid*, or other malignant disease, if the progress of the disease, and the existing phenomena, have received even tolerable attention. The absence of a persistent bronchitis, of a dark expec-

toration resembling black-currant jelly, and the absence also of a varicose or enlarged state of the veins of the surface, and of œdema of the side affected, will assist the diagnosis.

141. It was shown by me in 1815, and on subsequent occasions in 1820, 1824 (*see Med. and Phys. Journ.* vol. xliv. p. 530., and Notes to RICHERAND's Physiology, p. 626.), long before the subject was noticed by TIEDEMANN, GMELIN, LIEBIG, and others, that, when the functions of the lungs are in any way impeded, the liver often performs a vicariously increased function, thereby preserving the blood from the impure or morbid state into which it would otherwise pass. This increased function of the liver is very generally remarked in the course of empyema. But, in addition to increased function, there also not unfrequently supervene congestion, and more or less enlargement of the liver, owing to the difficult or impeded circulation of blood through the lungs, and the equally impeded return of it from the hepatic vein. This enlarged, or at least congested, state of the liver, in most cases of empyema of any considerable duration, should not be overlooked, or mistaken for a partial empyema of the right side, which, however, it may accompany as well as empyema of the left side. The enlargement of the liver from congestion, or from impeded and impaired function of the lungs, generally supervenes to the vicariously increased action of the organ, and is observed chiefly in the more chronic cases of empyema.

142. *f.* The diagnosis between pleurisy with effusion and *hydrothorax*, and between empyema and this latter, is by no means easy, unless the history of the case be well known. The circumstance of hydrothorax being generally consequent upon disease of the heart, upon a far advanced stage of disease of the lungs, especially congestive pneumonia, œdema of the lungs, &c. or upon the last stage of other forms of dropsy, as ascites, anasarca, &c. is sufficient to prevent any difficulty in the great majority of cases, to which the term hydrothorax is strictly applicable. Yet passive effusion may occur, although in comparatively rare instances, either in one or in both lungs, and be distinguished with difficulty from the asthenic and latent forms of pleurisy, more especially when the passive effusion is confined to one side of the chest, which is seldom the case when altogether independent of inflammation of the pleura. When dropsy of the pleura, however, is caused by disease of the lungs, it is then generally confined to the same side as the affected lung, or is greatest on that side.

143. In most cases, the chief differences that can be observed between chronic pleurisy or empyema and hydrothorax are, that the dilatation of the intercostal spaces is comparatively slight in hydrothorax, whilst protrusion of them or of the diaphragm is not observed in this latter. Dr. STOKES imputes this circumstance chiefly to the pathological state of the pleura and the adjoining muscles, and to the puriform character of the effused fluid; but something may also be imputed to the amount of effusion, which is rarely so great in either pleura in pure hydrothorax as in pleurisy, and hence a change of sound, varying with the position of the patient, may generally be recognised in hydrothorax, unless the passive effusion is consequent upon the existence of several old pleuritic adhesions. Dr. STOKES adverts to the following diagnosis between empyema and hydrothorax, as given by HIPPOCRATES and noticed by LAENNEC:—"You shall know by this that the chest contains water, and not pus, if, on applying the ear during a certain time on the side, you perceive a noise like that of boiling vinegar;"—and remarks that, when we consider the conditions of the lung in empyema and hydrothorax, the diagnosis of HIPPOCRATES seems much more accurate than LAENNEC has admitted. In empyema the lung is but rarely affected, and no râle is heard, "no sound of boiling vinegar;" whilst hydrothorax rarely occurs without more or less of œdema or congestion of the lung; so that, the presence of liquid in the chest being admitted, the occurrence of râle would indicate hydrothorax rather than empyema.

144. IX. PROGNOSIS.—The prognosis of pleurisy depends upon the form, state, and progress of the disease; upon the previous health and age of the patient; upon the rapidity and amount of the effusion; and upon the duration of the malady, in connection with the treatment which has been employed. The sthenic forms of the disease occurring in previously healthy persons, and brought early under treatment, although serious in their consequences, and therefore requiring a most watchful attention, generally yield to judicious treatment, especially when employed promptly, or before effusion into the pleural cavity has become abundant. If, however, pleurisy have been neglected, or improperly treated; if it have attacked a cachectic or broken-down constitution, or assumed an asthenic form; if it have been latent, and hence existed for some time before it was recognised; if it have supervened upon disease of the lungs, heart, liver, or peritoneum—more especially upon tuberculous deposits in the lungs, it is a most dangerous, and, in the latter circumstances more especially, even fatal malady.

145. When the disease attacks a person who has been exposed to depressing agents—to cold, humidity, insufficient nourishment, and anxiety of mind; when the effusion increases rapidly notwithstanding the employment of judicious means of cure,—when it appears in the scrofulous diathesis, or affects the pleura of both sides, or is attended by purulent expectoration, emaciation, or night sweats, or when the constitutional symptoms assume the hectic character,—when debility increases, and the urine becomes scanty, or œdema of the extremities supervenes,—and especially when these very unfavourable symptoms advance or continue for some time, the danger should be considered as very great, more particularly in the latter circumstances now enumerated. The prognosis in the complicated, the chronic, and the empyemic states of the malady is always very unfavourable, but more especially when occurring in the debilitated, the cachectic and intemperate; the amount of danger being generally extreme, when the disease has for some time resisted the usual remedies, or when the constitutional powers give way.

146. In those cases of empyema, in which the matter finds its way through the lungs or external parietes of the chest, although the danger is great, still recovery may take place if the vital influence be not much impaired, if hectic symptoms be not developed, and if extensive disorganisation be not

present. The strength, constitution, and age of the patient, in connection with the other circumstances of the case, should guide opinion as to the result. In the great majority of instances, however, the spontaneous evacuation of the fluid affords only temporary relief, the subsequent discharge and the hectic fever ultimately sinking the patient. The prolonged retention of the matter, and the consecutive changes in the lungs and parts adjoining the fluid collection, before a spontaneous discharge can be effected, generally sink the constitutional powers, and prevent a restoration of the lesions which have taken place, which are, however, usually too extensive to admit of restoration under any circumstances. Those cases in which the discharge is procured by operation admit of a much more favourable prognosis, especially when the operation has not been too long delayed, or until the alterations of the lungs and adjoining organs and parts are not rendered too great to admit even of a partial removal; but in these cases the result much depends upon the peculiarities of the case, and the circumstances under which the operation is performed.

147. Acute pleurisy seldom proves fatal merely from the amount of the effusion, until it is passing, or has passed, into the chronic state; and even then, so rapid a termination is met with chiefly in the cachectic, and in cases of double pleurisy, or when previous disease exists in the lungs or some other viscus. The rapid accumulation of the fluid, however, is a very unfavourable occurrence in any circumstances of the case, as it indicates great defect of constitutional power, and an inability to effect its removal. An opinion of the result cannot be formed correctly in any case of the disease, until the more acute symptoms have subsided, or until the effects of the means usually employed for this purpose become apparent; and then the issue depends much upon the age and constitution of the patient. When the sounds of percussion and respiration return, however gradually, and the other symptoms and signs disappear, a doubt need not be entertained of a favourable result, especially if the lungs furnish no indication of disease.

148. X. PLEURA-PNEUMONIA—*Pleuro-pneumonia* — *Pleuro-pneumonitis* — *Peripneumonia* — *Peripneumony*, &c. — or the association of inflammation of the pleura with that of the substance of the lung is so frequent, that these distinct diseases have been very often treated of as one, and with the belief that the one does not occur without the other. This, however, has been shown not to be the case, although they are frequently conjoined, as I have shown above, and when treating of inflammation of the lungs (see Art. LUNGS, §§ 73. *et seq.*). The intimate connection subsisting between inflammations of the pleura and of the pulmonary parenchyma, and the frequent complication of these diseases, lead me further to remark, that *pleura-pneumonia* presents itself in practice in *three states*, which present certain differences in their progress, according as either tissue is prominently affected: — 1st. *Pneumonia* associated with slight pleurisy; — 2d. *Pleurisy* complicated with slight pneumonia; — and 3d. *Pleura-pneumonia* properly so called, in which the two affections seem nearly equal in degree.

149. i. *Pneumonia associated with slight pleurisy.* — In those cases in which inflammation of the lung reaches to the pleura, in any point, lymph is thrown out upon the free surface of that portion of pleura; but in persons of a previously healthy constitution, the lymph effused is usually in small quantity, forming a false membrane, which extends no further than the portion of pleura covering the inflamed or hepatised portion of lung immediately underneath. If the disease be of the sthenic character, or if it be unconnected with cachexia, constitutional vice, or a contaminated state of the circulating fluids, the inflammation, thus extending to a portion only of the pulmonary pleura, does not spread over the surface of this membrane, although the lymph thrown out will frequently excite a corresponding irritation or inflammation of the portion of the costal pleura with which it comes in contact, and thereby give rise to adhesions between the opposite surfaces. If the pneumonia and consequent hepatisation occupy a portion only of the lung, the effusion on the serous surface is only slight, consisting of a sero-albuminous, or sero-puriform exudation. But if nearly the whole lung be affected, then there is often little or no effusion, a very thin or imperfect false membrane only being seen on its serous surface, which is thicker along the edges and in the interlobular fissures, and in some other points when the inflammation had first reached this surface. This is a very common form of *dry pleurisy* complicated with pneumonia; and in this complication the pleurisy is merely contingent upon the pneumonia, and scarcely at all modifies the severity or progress of the primary disease. M. LAENNEC remarks that it would be very difficult to distinguish this particular complication from a pleurisy with copious effusion, if the patient had not been seen before this period; the absence of the thoracic resonance is here as complete as if the whole surface of the lung were covered by a pleuritic effusion, while the stitch in the side commonly attending the extension of the inflammation to the pleura would further induce the belief that the disease was simple pleurisy. When, however, the lung is completely hepatised without any attending effusion into the pleural cavity, there is always a strongly marked broncophonism in different points, and particularly toward the summit and root of the lung — a sign which never exists in the same degree, or over the same extent, in pleurisy or pleuro-pneumonia. If the patient have been seen from the origin of the disease, the diagnosis is much more easy. If the disease be pneumonia, crepitation will have been heard previously to the complete cessation of the respiratory murmur; and the gradual diminution of the resonance on percussion, and the supervention of a friction or rubbing sound, as described when treating of the *dry form* of pleurisy (§§ 42. *et seq.*), will leave no doubt of the nature of the affection. In pleurisy the loss of resonance is very rapid, and exists, if the lungs have been previously healthy and without adhesions, over the whole of the affected side. Œgophonism, moreover, is always perceptible at least for one or two days.

150. ii. *Pleurisy complicated with slight pneumonia.* — If the pleuritic attack be severe, and the effusion so rapid and abundant as suddenly to compress the lung, it is not uncommon for inflammation of some points of the pulmonary substance to occur, particularly in the lower lobe. These points sometimes remain distinct and of small ex-

tent, constituting one of the varieties of *lobular pneumonia*. The pulmonary inflammation is here much modified by the pleuritic effusion, as I have shown in the article LUNGS (§ 73.), and it rarely extends much further than a few lobules, and still more rarely advances to suppuration. This complication can only take place early in the attack, and before the effusion and consequent compression of the lung have become very considerable; as a lung greatly compressed is hardly susceptible of inflammation, the *symptoms* and *signs* of this complication are described in the article now referred to (§ 75.).

151. iii. *Pleuro-pneumonia properly so called.*— The association of an inflammation of the whole or part of the pleura, with considerable effusion, and of a severe pneumonia, is not so frequently met with as either of the two complications just noticed. M. LAENNEC remarks that pleurisy conjoined with pneumonia does not increase the danger of the latter; on the contrary it lessens the danger as above stated, by compressing the lung. On the other hand, the pneumonia at first augments the danger of the pleurisy, which is rarely fatal in the acute stage; but it favours a more rapid absorption of the effusion, by preventing this from becoming as copious as in simple pleurisy, the inflammation rendering the lung less compressible. Hence pleuro-pneumonia, *cæteris paribus*, may be regarded as less dangerous than either simple pleurisy, or simple pneumonia.

152. Pleuro-pneumonia is recognised by the union of the signs of pleurisy and of pneumonia; and some of these signs are even more permanent in this complication than in either of the simple affections; for they mutually impede and retard each other's progress when these inflammations are conjoined. The crepitation on the one hand, and the œgophony on the other, are thus often heard up to the period of convalescence. In cases of this kind, œgophony is seldom simple; it is perceptible only at the root of the lung, around the lower angle of the scapula; and, from the vicinity of the large bronchial trunks and the density of the pulmonary substance, it is usually combined with marked bronchophony. This conjunction of these two signs, LAENNEC has likened to the squeaking of Punchinello.

153. XI. TREATMENT. — i. HISTORY OF THE TREATMENT OF PLEURISY. — (*a.*) Amongst the several means advised by the older writers for the cure of pleurisy, *bloodletting* was considered of the first importance; but there are various circumstances which have been noticed in connection with it, by these writers, that deserve a brief notice. HIPPOCRATES advised bleeding "ad deliquium animi." ARETÆUS insisted upon the necessity of early and repeated venesection, but cautioned against carrying it so far as to produce syncope. He distinctly stated the nature and seat of the disease; and remarked that it was either sporadic or epidemic. AËTIUS was the first to point out some of the conditions which indicate the impropriety of having recourse to bloodletting, and imputed these conditions to indigestion and crudities of the stomach. CÆLIUS AURELIANUS and other Methodists advised bloodletting, but condemned the practice of carrying it to the length of causing syncope. ALEXANDER TRALLIANUS seems to have been the first to advise local depletion for this disease, according to the manner of cupping then in use. AVICENNA, and other Arabian physicians, generally had recourse to venesection and cupping, and the rest of the antiphlogistic plan.

154. The question as to the greater efficacy of bleeding from the same side as that affected in pleurisy, or from the opposite side, was agitated at a very early period. The Greek and Latin authorities were divided in opinion as to this question. HIPPOCRATES, GALEN, and CELSUS, advised bleeding from the arm of the affected side; whilst ARETÆUS, AËTIUS, and CÆLIUS AURELIANUS directed it from the opposite side. The discussion was carried down by the ARABIANS, who, however, generally bled from the arm of the unaffected side; and by the writers of the fifteenth, sixteenth, and seventeenth centuries, some of whom, as AMATUS LUSITANUS, VESALIUS, TRINCAVELLI, RULAND, SAILLANS, WIPACHER, RODRIGUEZ, BERTIN, and others, discussed the subject as one of the utmost importance.

155. Other circumstances, of greater moment than this, were at last noticed in connection with bleeding for pleurisy, by SYDENHAM, CALLISEN, BAGLIVI, and others, who insisted upon the injurious tendency of bleeding in cachectic and asthenic states of the disease, or when the blood did not present a buffed or cupped appearance. MURSINNA, STOLL, and many recent writers, have likewise cautioned against bleeding in these cases, as well as in those which present a putrid character, or a bilious in connection with an asthenic diathesis; and have likewise warned the inexperienced against repeating venesection, or carrying it too far merely because the blood was buffed — a caution of no small importance.

156. There can be no doubt of pleurisy being much more prevalent at some seasons or in certain years than at others, and thus assuming according to the circumstances of season or locality more or less of an *endemic*, or an *epidemic* form; and there is no less doubt of the character of the disease varying remarkably at different periods, and in distinct localities; it being, in one or the other, of a much more phlogistic and acute form, than in the rest, or assuming even an asthenic or latent character. And hence, indeed, may arise the fact that bloodletting and other parts of the antiphlogistic treatment have been advised with very different degrees of boldness by different writers. We find that, since the days of GALEN, prejudices existed in Rome against large bleedings in this and other acute diseases; and these were very probably well-founded, in respect of that and all other large cities in ancient times, as they are as regards this city and other large towns at the present day. The opinions of medical writers are too generally based upon the narrow or peculiar circumstances of their own practice, either previously to or at the time of their writing; and all have neither the inclination nor the time to acknowledge the change of opinions which further experience and more diversified opportunities have occasioned. We find that DOVER, CLEGHORN, HUXHAM, and many others, advised very large, prompt, and repeated venesection; and that RIVERIUS, LE MERCIER, STOLL, and SIMS, recommended that it should be performed in both arms at the same time. A more enlightened experience, and more diversified opportunities of observation, have now demonstrated that this practice may have been appropriate in many of

the circumstances in which these writers had recourse to it; but that there are other circumstances, in respect not only of the individual, but also of the season, locality, and epidemic constitution, which render it altogether unsuitable and injurious; whilst there are certain conditions of the disease which I have endeavoured to point out, that require very different or even opposite measures. In the more doubtful circumstances of the case, or when the propriety of bleeding from the arm, or of the repetition of such bleeding, admits of dispute, the application of leeches to the side, as advised by ZACUTUS LUSITANUS, SCHMUCKER, SARCOME, and HUFELAND, should be resorted to.

157. (*b.*) *Emetics* were formerly much resorted to, but they are now but little employed for the cure of pleurisy. They, however, have had the sanction of RIVERIUS, RULAND, BLEONY, MURSINNA, MORGAGNI, WRIGHT, STOLL, TISSOT, ACKERMANN, and SCHELHAMMER; and I can add that, when they are discreetly prescribed, they are important aids in the treatment of most of the forms of the disease. They should not be exhibited until after bleeding has been resorted to in the more phlogistic cases. They will often relieve the dyspnœa and oppression attending the stage of effusion, and promote absorption, when judiciously selected and associated with other means which are suited to the circumstances of the case.—*Purgatives* are much less beneficial than emetics in this disease. Very active purging is seldom requisite, unless when there are accumulations of excretions and morbid secretions to remove; but it is always necessary freely to promote the secreting and excreting actions of the abdominal viscera. Conformably with this principle, *diuretics* are generally beneficial, especially at an advanced period of the disease, or when effusion has taken place, and when conjoined with cooling diaphoretics or other appropriate measures.

158. (*c.*) *Mercurials*, especially calomel, in full or even very large doses in the more acute cases, with antimonials, or opium, or with both, according to circumstances, are often, in this as well as in other inflammations of serous membranes, of the greatest advantage. They have been much recommended by LIND, WRIGHT, FINCH, HAMILTON, and others, and the experience of recent writers has confirmed the statements of their predecessors. The active exhibition of calomel, either alone or in the combinations now mentioned, is even more necessary in the early stages of pleuritis than in those of pneumonia; and, in the more advanced stages, or when effusion has taken place, either this or some other mercurial preparation, conjoined with diaphoretics, or diuretics, and aided by external rubefacients and derivents, is of the greatest benefit. I have often given the bi-chlorate in small doses, either thus associated, or with other tonics and alteratives, as cinchona, sarza, &c. with marked benefit, at an advanced stage of the disease, and more especially of the latent and asthenic forms.

159. (*d.*) *Antimonials* are not so beneficial in pleurisy as in pneumonia, yet have they long possessed a high reputation in the former disease, and have been much confided in by AGRICOLA, MILLAR, BROCKLESBY, BELFOUR, LAENNEC, and many others. Of these preparations the kermes mineral and tartar emetic have been most employed, although the empirical powder of James, and others, have also been prescribed with advantage. The kermes mineral was recommended by VON MERTENS, BANG, SIMS, MONTRAL, COLOMBIER, &c. in doses of one fourth or one third of a grain given every two or three hours, whilst the tartar emetic was adopted by CALLISEN, MILLAR, BELFOUR, LAENNEC, and numerous modern writers. Antimonials have rarely been confided in alone for the cure of pleurisy, but have usually been prescribed in aid of vascular depletions, and for the reduction of vascular action and the promotion of perspiration; the substances most beneficially conjoined with them being mercurials, opiates, and other sedatives, or cooling diaphoretics and diuretics, more particularly the solution of the acetate of ammonia, or of the nitrate of potash, and the nitric æther or the spirits of nitric æther.

160. (*e.*) Opium and other narcotics have been used by several writers, but generally in combination with other medicines, according to the stage of the disease and circumstances of the case, and with the intention of allaying pain, and of promoting the operation of the substances with which they were conjoined; as with calomel by HAMILTON, to determine the constitutional operation of this medicine; with ipecacuanha and nitre by DOVER, to determine the diaphoretic action of these substances, or with diuretics to ensure their operation on the kidneys. Opium was much praised by KORTUM for pleurisy; and certainly, in conjunction with calomel or other mercurials, and with an antimonial preparation, or in the form of Dover's powder, as I have advised it in other inflammations of serous surfaces, it is of great service, especially after bloodletting in the more phlogistic cases; and with alteratives, or diaphoretics, or mercurials, &c. in the more advanced stages.

161. (*f*) Of other medicines which have been resorted to in pleurisy, there are few which deserve a particular notice. *Camphor* has been much praised by BAGLIVI, GRIMM, TISSOT, GRUELMANN and SCHELHAMMER, especially in conjunction with nitre. I have prescribed this medicine very often in the more asthenic forms, and in advanced stages of the more sthenic stages, of the disease, and frequently with great benefit, but generally with a mercurial alterative, or other substances, according to the circumstances of the case. *Ammonia* was employed by CHALMERS; HOFFMANN's *æther*, and other stimulants, by TISSOT; and *benzoin* by HOFFMANN; but they are serviceable chiefly in asthenic forms, and contingent conditions of the disease. I may add, that *aconite* was recommended by GEBEL in combination with an antimonial medicine for the rheumatic form or complication of the disease, in which form also *arnica* was much used by several German writers.

162. (*g.*) The *inhalation of warm vapour* was advised for pleurisy by HIPPOCRATES, and of numerous forms of warm medicated vapours, by modern writers. I however much doubt their efficacy, unless as adjuvants, in this disease, in which, as well as in peripneumonia, this practice should not be overlooked, especially in cold and dry states of the atmosphere. In these circumstances of weather and of disease, I have had re-

course to it on numerous occasions. In a case attended in 1826 by Dr. T. Gordon, Sir J. Annesley, and myself, the vapour of boiling water was introduced into the apartment, and within the curtains of the bed, by means of a tube leading from a boiler on the fire of the room.—As to the use of *medicated vapours*, I need add nothing to what I have stated respecting bronchitis (see Article Bronchi, § 98. *et seq.*), as much of what I have there advanced is applicable to pleurisy as well as to pneumonia and bronchitis, and to most of these complications.

163. (*h.*) *Demulcent and oleaginous medicines* were very generally employed by both ancient and modern writers, in expectation of obtaining a soothing effect from them, as regarded the pain and the cough of pleurisy, and as a vehicle for more active substances. *Linseed oil*, and *decoctions*, and *almond oil*, were chiefly thus prescribed by Sydenham, Lange, Spindler, and others, and were often associated with *camphor*, *opium*, and other sedatives, by Gilibert, De Haen, Kortum, and numerous more recent authors. Many other demulcents and mucilaginous preparations have been used, as the *decoctum althææ*, &c., but they require no further notice at this place.

164. (*i.*) Numerous *external means* were advised for pleurisy by most writers, from Hippocrates to this time. *Warm fomentations* of various kinds, and both humid and dry, were much employed; and even *topical cold*, by evaporating lotions, or by means of ice or snow, as advised by Bartholinus, was even resorted to. Of this latter but few modern physicians will form a favourable opinion, although certain analogical facts may be adduced in its favour. *Sinapisms*, and other rubefacient applications to the side affected were advised by Celsus and others of the ancients, as well as by the Arabian and modern writers; and they are certainly of more or less benefit, according to the knowledge by which a recourse to them is guided. The most beneficial rubefacient, however, which can be employed, the most appropriate to all circumstances of the disease, and the least liable to be injurious in any, is the *spirit of turpentine*, in the form either of epithem, or of liniment, or of embrocation, or conjoined with oil, or camphor, ammonia, and oil with opium; and repeated or renewed according to the effects produced, and to the peculiarities and complications of the case.

165. (*k.*) *Vesicants* over the part affected were recommended by Amatus Lusitanus, Conradi, Brocklesby, Gardanne, Grimm, Thomann, De Haen, Tralles, and Engelhart. But they should be prescribed only after bleeding in the more sthenic or phlegistic cases; be large, and repeated even oftener than once in the more chronic states of the disease; and be aided by mercurials, diuretics, and alteratives, according to circumstances. The propriety of applying them over the affected part, especially when there is reason to suppose that the costal pleura is inflamed, and when the patient is thin or emaciated, may be reasonably questioned. In these circumstances, I have generally directed them to be applied, either more or less below the seat of pain, or on the opposite side. In the more asthenic and chronic forms of the disease, a repetition of them, generally in quick succession, in different parts of the thorax, are often of great service, Plummer's pill, with ipecacuanha and opium, being given at night, and small doses of the iodide of potassium and liquor potassæ with sarsaparilla being taken during the day. The repeated application of *moxas* to the affected side has been a common practice from the earliest ages in eastern countries, and has been frequently had recourse to in Europe by modern physicians with considerable advantage in chronic cases of the disease. In these cases, as well as during convalescence from acute attacks, I have often prescribed a large plaster to be kept applied upon the affected side, consisting either of the emplastrum ammoniacum cum hydrargyro, or of a combination of this with the emplastrum picis compositum.

166. ii. Treatment advised by the Author.—The *intentions of cure* are nearly the same for the several forms of pleurisy, although each form requires a more or less marked modification of the plan and of the means by which these intentions are to be fulfilled. The *first* object is to arrest the progress of the inflammation; the *second*, to promote the removal of the products and the consequences of the inflammation; and the *third*, to enable the constitutional powers to resist, in the more chronic cases, the injurious influence of the structural changes produced, and if possible to counteract or overcome them.

167. *A.* In sthenic acute Pleurisy, the obvious indication is to arrest the progress of the inflammation by the means recommended for other inflammations of this character affecting other serous tissues, namely, by *bloodletting* to an amount which the age and constitution of the patient, the hardness of the pulse, and the duration of the attack will suggest. If the patient be robust, if the disease has not advanced so far as to give rise to great effusion, and if the pulse be hard and inspiration painful, general bleeding should be promptly resorted to and carried sufficiently far to relieve the respiration, and to make a decided impression on the pulse, without however producing full syncope, for the reasons stated in the Article Blood (see §§ 64. *et seq.*). Contemporaneously, or nearly so, with the bloodletting, a full dose of *calomel*, *antimony*, or *ipecacuanha* and *opium* should be given, taking care that the dose of the antimony or ipecacuanha should not be such as to occasion vomiting. The effect of these I have so frequently shown to be such as will promote the good effects of vascular depletion, and often prevent the necessity of repeating this measure, that I need not here recur to the subject. If, however, pain on inspiration or when coughing, or hardness of the pulse, should return, bloodletting ought to be repeated, and the other medicines just named again be exhibited after the operation. In some cases, more especially if the patient be not very robust or be not plethoric, *local depletion*, by means of *cupping* a short distance from the spine, or of *leeches* near the part, may be employed *in place* of the second venesection; and, in more robust and plethoric persons, *after* the second bloodletting, if the pulse should rise, and the febrile symptoms increase. The application of leeches should be followed by a succession of warm poultices, or several folds of warm moist cloths or flannels, covered by dry napkins.

168. It will generally be requisite to give some *purgative medicine*, in order to keep down febrile

re-action, and derive the circulation from the seat of disease. But this medicine should not interfere with the effects of those just recommended, and therefore it ought not to be given until some hours afterwards; and, during its operation, care should be taken to prevent the free perspiration, usually produced by the medicines previously given, from being checked. The purgative operation may be further promoted, if it be required, by *enemata*, more especially such as contain the oleum terebinthinæ, or may be left to them alone, particularly when the bowels are not confined. In addition to the means now advised, suitable *diaphoretics* should be given at short intervals. The most generally appropriate are those which consist of the liquor ammoniæ acetatis, spiritus ætheris nitrici, and either the vinum antimonii tartarizati, or vinum ipecacuanhæ, with camphor water. To these may be added other medicines, such as digitalis or hyoscyamus, or both, as circumstances may suggest; or a preparation of colchicum may be substituted for the antimony or ipecacuanha, but its operation should be carefully watched.

169. In this form of the disease, and more especially if it have made considerable progress before it came under treatment, the repetition of the calomel with James's powder or with ipecacuanha and opium becomes necessary. The frequency of their exhibition should depend upon the dose prescribed and the urgency of the case. I have usually directed full or large doses, particularly of the calomel or opium, at intervals of six, eight, ten, or twelve hours, and the saline medicine, mentioned above, to be taken in the intervals, until the gums indicate a slight affection, or the evacuations assume a green or very dark hue.

170. The above treatment will generally accomplish the first intention, and the latter part of it partly fulfil the second. But it may happen that, when we have happily arrived thus far, exposure to a current of air, or some untoward circumstance, may occasion a *relapse*, or a *recrudescence* of the disease; and the physician will then propose to himself this question,—Ought general bloodletting now to be resorted to, or should local depletion be confided in? In this state of the case he will duly consider the amount and effects of the previous vascular depletions, the duration of the disease, and the probable amount of effusion, the existing states of the pulse and of respiration, the pain and other symptoms in connection with the age and constitution of the patient, and decide accordingly. But, if a due estimation of all these prevent him from venturing upon general bloodletting, he will decide in favour of the application of leeches, the number varying with the exigencies of the case; and he may even see occasion to repeat them, and to follow them with the warm poultices and fomentations already advised (§§ 167.).

171. In order to prevent the further progress of the disease and its consequences, as well as to remove its more immediate results, additional means are often required, more especially after the inflammatory or acute symptoms are reduced. At first the *turpentine epithem* may be applied over the affected side, or folds of warm flannel moistened with this substance, or with embrocations containing a large proportion of it (see Form. 295. *et seq.*). These may even suffice, and prevent the necessity of having recourse to other means; but if they do not produce a decidedly beneficial effect in the course of twenty-four or thirty-six hours, or little more, they should be replaced by a large *blister*, which will generally produce its effects in about six hours, when it should be removed, and the part be covered with a large warm bread-and-water poultice. This ought to be frequently renewed. It will rarely fail to procure a free discharge from the blistered surface.

172. If the disease has made considerable progress, or if the effusion is considerable, it will generally be requisite to keep up a slight mercurial effect on the gums and to repeat the blister either over or near the part. But in no instance should the blisters, or the vesicating tissues employed in their stead, be applied longer than six or eight hours; they should be then replaced by warm poultices, which will cause them to rise, and prevent the inflammation produced by them from extending below the integuments. In some instances, particularly in those which have proved most obstinate, and when no mercurial effect has been produced, I have directed the blistered surface to be dressed with the mild mercurial ointment, or with this in part; and have generally seen benefit derived from the measure. If the disease be not cured by the above treatment—a contingency which generally arises from some complication or pre-existing affection, or from the advanced progress of the malady before it came under treatment, or from a constitutional vice, as the scrofulous or tubercular—it then assumes the *chronic form*, to which attention will be more particularly directed in the sequel.

173. *B.* THE ASTHENIC AND THE LATENT STATES OF PLEURISY (§§ 47—50.) are often advanced to a more or less copious effusion before they come under treatment; and for this reason, and still more from the state of the disease, they rarely admit of general bloodletting, unless they are seen at a very early stage, and the asthenic diathesis is not very prominent. An intimate knowledge of morbid actions, conjoined with close observation and an experienced recourse to remedial agents, can in no circumstances be more advantageously evinced than in the course of treating these and the preceding forms of pleurisy—in determining, in the sthenic, how far to carry, and how often to repeat, vascular depletion, and in the asthenic and latent as to the propriety of adopting this practice, and as to the manner and the extent of carrying it out when it is determined upon. It should entirely depend upon the state of the pulse, the age and constitution of the patient, and the progress of the disease, whether a moderate bloodletting or leeches be prescribed. Cases may occur when both may be required, and others where neither is admissible, owing to the depression of vital power and the great amount of fluid effusion, which had taken place before the disease had come under treatment.

174. In these states—in those in which vascular depletions have been practised, as well as in those in which they are inadmissible—recourse should be had, in a prompt and efficient manner, to alterative and diuretic remedies. If the effused fluid be not inferred to be of the puriform character—a state of the effused fluid, very rarely observed in an early period even of the asthenic and latent forms of the malady—calomel should be given with opium and small quantities of camphor,

twice or thrice a day; the infusion of digitalis, with the nitrate of potash, the spiritus ætheris nitrici and oxymel of squills, being taken in the intervals in doses which the peculiarities of the case will suggest. The digitalis will be more certainly beneficial if it be given at first in as large doses as may be prudently exhibited, each dose after the second or third being diminished. The terebinthinate epithem or embrocation should at the same time be applied over the affected side, and be renewed according to the effect.

175. In cases of longer duration—when the disease has existed two or three weeks—and when the quantity of fluid effused is considerable, acute or inflammatory symptoms having subsided, the treatment should partly depend upon the means which had already been employed. If the patient be seen for the first time, the internal and external remedies just now mentioned should be resorted to; but if these or similar agents have been employed without avail, the pilula hydrarg. chloridi comp. with the pilula scillæ and digitalis may be given night and morning, and two or three doses of the iodide of potassium in solution with the spiritus ætheris nitrici, or some other diuretic, in the course of the day. Blisters should not, at the same time, be overlooked; they may be repeated according to circumstances, in the manner already recommended, in order to obtain their most beneficial effects, and to secure a free discharge from them. They are certainly beneficial, but not to the extent stated by some recent writers. In some instances I have prescribed the *iodide of mercury* internally with small doses of squills and digitalis with seeming advantage; and in others directed the *iodide of lead* to be used externally in the form of an ointment, according to the following formula, a small piece of it being well rubbed over the affected side every night, or both night and morning, the side being covered afterwards by a piece of flannel:—

No. 235. Plumbi Iodidi, ʒj; Unguenti Hydrarg. mitioris et Adipis præpar., āā ʒvj. Misce bene, et fiat unguentum.

176. The effects of iodide of potassium in this disease are very uncertain. In some I have found it very serviceable, in others of doubtful advantage; and in a few I have considered it prejudicial. I have employed it in dropsical diseases of all kinds for very many years, since the time of its first preparation, and can therefore say, from considerable experience, that its effects should be carefully observed, in the asthenic and latent forms of this disease; for, in some of the more extreme of these, it may prove, as I have found it in two or three cases, distressingly depressing, although given in very small doses. In these cases the iodide of iron, taken in syrup of sarza, may prove more serviceable, especially when aided by the continued application of the emplastrum ammoniaci cum hydrargyro, or by a plaster consisting of equal parts of this, and the emplastrum picis comp. In most cases of the disease, these last means will prove of great service, in promoting the absorption of the fluid, during early convalescence, or when the fluid is partly removed. At this period, change of air—especially to a mild, pure, and dry air, or to the sea-side, in a sheltered situation, and suitable diet and regimen—avoiding vascular excitement, yet sufficiently supporting the powers of life, should always be recommended.

177. It is not unusual to observe, in the more asthenic cases of pleurisy especially, an abundant and rapidly increasing effusion, occasioning the greatest distress, and even threatening the dissolution of the patient, by its pressure on, and displacement of the lungs, heart and large vessels, notwithstanding a judicious recourse to internal and external means. When this result is met with, more especially in very delicate, or scrofulous persons, or in the asthenic and latent states of the disease, the remedies already noticed having proved inefficacious, no further time should be lost before recourse be had to *paracentesis thoracis*—to the removal of the fluid through an opening made in the parietes of the chest. It is obvious that, as soon as the medical treatment proves itself inefficacious, this operation should be resorted to, for delay will diminish the chances of success from its performance. As this operation is also required in the chronic states of the disease, more especially for empyema, it will be more particularly noticed hereafter.

178. *C.* PARTIAL AND DOUBLE PLEURISY (§§ 51—62.) require but little modification of the treatment already advised, which should be adapted to the peculiar features of individual cases. Where the symptoms are acute, and at the same time of the *sthenic* character, the antiphlogistic means should be employed accordingly, and with due reference to each feature of the case. When they partake more of the *asthenic* form, the measures mentioned in connection with it then are requisite. It may be remarked, that while partial pleurisy more generally presents the former character, double pleurisy commonly possesses most of the latter, and especially requires prompt and efficient treatment, which, however, is in no way different from that which has been already advised.

179. *D.* CHRONIC PLEURISY AND EMPYEMA.—*a.* If the disease have become chronic before treatment has been employed, then the duration of the disease, the amount and probable nature of the effusion, and the urgency of the symptoms, will suggest the measures which should be adopted. If the malady have become chronic, owing to the failure of the means resorted to, or to the constitution of the patient, or to both causes conjoined, as usually observed, the question may still be entertained as to what may be further tried. In the former circumstances, if the indications above stated (§§ 137. *et seq.*) as to the purulent nature of the effusion be not present, and if the duration of the disease have not been above two or three weeks, then the internal and external treatment advised above (§§ 174—177.) may be tried—promptly and efficiently—before recourse shall be had to *paracentesis thoracis*. If however protrusion of the intercostal spaces, hectic and other symptoms indicate a puriform state of the pleural collection, no time should be lost before resorting to this operation. In the latter circumstances referred to, especially when the treatment has been judicious—no appropriate and efficient means having been overlooked, the operation is equally required, whatever may be the nature of the fluid collection, although, perhaps, it may be more urgently called for when indications of a purulent character are present; for where these indications exist, no other means will save the patient. The several writers who agree in the propriety of having recourse to

this operation—especially LARREY, J. P. FRANK, LAENNEC, FORBES, BELL, ELLIOTSON, WILLIAMS, DAVIS, and H. ROE—advise its performance when the effusion proceeds so rapidly as to threaten the life of the patient, or when it either increases or remains stationary under the use of the means already recommended, although the dyspnœa may not be urgent, or the danger immediate, for the continuance of the morbid collection and the compressed state of the lungs may prevent this organ from recovering its functions. Dr. H. ROE justly remarks, that "for empyema paracentesis should always be performed the moment the nature of the case is ascertained. For serous effusions occurring in persons of scrofulous habits, or very delicate health, after pleuritic attacks, for the cure of which the necessary treatment has either failed, or been neglected, paracentesis will generally be required." (p. 208.)

180. *b.* There are certain *conditions* requisite to the success of the operation. It is most important that it should be performed before either the vital powers of the patient are too much reduced, or the thoracic viscera have undergone serious organic lesions. It is chiefly when the lung still possesses the power of expanding after the pressure upon it is withdrawn, that a cure can be effected without deformity of the side. If, however, the operation be delayed until the lung has become atrophied, condensed, or bound down by adhesions, so as to be incapable of expanding sufficiently to meet the ribs, either the vacuum will be rapidly refilled with fluid, or the shoulder will be depressed and the side contracted. This last change seldom occurs immediately after an operation, although it takes place gradually and to a great extent when the fluid is absorbed. The reaccumulation of the fluid will, therefore, be most likely to occur, when the lung is incapable of expanding sufficiently after the operation. When this is the case, a space must necessarily intervene between the surfaces of the pleura, and either the fluid is thereby prevented from being drawn off during the operation, or it is replaced by atmospheric air, which is always injurious to the pleural surfaces and occasions a more puriform, and often an offensive renewal of the effusion, and the aggravation of both the local and constitutional symptoms; exhausting and ultimately destroying the patient. These consequences sufficiently show the propriety of an early recourse to the operation, but they are not satisfactory reasons for the neglect of it altogether, as urged by those who object to the performance of it.

181. When the operation is performed sufficiently early, even in the most rapid and urgent cases of empyema, the removal of the puriform collection allows the lung to expand, and the upper portions of the pleura to come in contact, and ultimately to adhere; and the adhesion gradually extends as the fluid is removed, until the opposite surfaces become agglutinated; and a cure is thus effected by the obliteration of the cavity throughout, or nearly so. In order to secure this desirable result, it would be most important to determine, were it possible, the exact period when the operation ought to be resorted to—when an operation would prevent the accession of those changes which usually become irremediable. It is manifest that, when indications appear of a puriform state of the collection, no delay should occur: and that, in many cases, it might be of advantage to ascertain, by means of the exploring needle, the exact nature of the effusion. If it be found that the fluid is serous, then Dr. H. ROE believes, that we may wait till the end of the third week, in hopes that medical treatment may cause absorption: and, if it does not, that the operation should not be longer deferred; for he considers, and I think justly, that the operation should not be postponed to a later period, lest organic changes in the thoracic viscera may become irremediable, and that it is therefore better that it should be performed too soon, than that this risk should be incurred by delay. Cases are recorded of patients who had been tapped successfully for pleuritic effusions of several months' duration; but there was no proof that the lungs expanded to their full dimensions in those cases, and that the recovery was complete. Dr. ROE states, that no case has occurred to him, in which the patient was *perfectly cured* when the operation was delayed until five or six weeks from the commencement of effusion. The non-expansion of the lung in these circumstances has always given rise to the introduction of more or less air into the cavity, in the cases which have come under my observation, however carefully the exclusion of it had been attempted: and the patient has usually sunk from a re-accumulation of a fœtid purulent secretion, or survived with a considerable loss of lung.

182. *c.* The *operation* being manifestly necessary, in the circumstances now stated, and its performance not admitting of delay, the *manner* and the *situation* in which it is most advantageously performed requires some consideration. The *situation* in which the opening into the chest should be made has been pointed out by LAENNEC, and it has been generally adopted by later authorities. He recommends the space between the fifth and sixth ribs, a little behind the digitations of the serratus major, as being the most dependent point in the horizontal position, generally the freest from adhesion, and the seat of the greatest quantity of fluid. In this situation the operation was performed in all the cases recorded by Dr. H. ROE.

183. The *manner* of performing this operation has recently received due attention. Formerly surgeons advised operations implicating serous surfaces with a perfect indifference to the action of the air upon those surfaces. But the injurious action of the atmospheric air upon serous or shut cavities especially, and indeed upon other surfaces or parts denuded of their epithelia, or separated from their natural connections, is now acknowledged by every enlightened observer. This is evidenced by the inflammatory irritation, terminating, in weak or unhealthy constitutions particularly, in offensive purulent discharges, and acute hectic fever. Of the *three* following modes of performing *paracentesis thoracis*, the one which should be adopted may be inferred from what I have just stated. According to one plan, an incision is made into an intercostal space, the fluid is evacuated at once, and the wound left open. Another method is to make an opening into the pleural cavity with a trochar, to keep the wound open by introducing a canula, or a catheter, or gum elastic tube, by which the fluid is to pass off gradually. The third mode consists in making an opening by a trochar or otherwise, and allow-

ing as much of the fluid to flow out as will escape without admitting the air, and in immediately closing the opening. This last method is that which I would recommend from observation of the results of these several methods, and for the following reasons:—*Firstly*. When the air, even in small quantity, comes in contact, either with the pleural surface, or with the false membrane formed on this surface, the state of morbid action and the fluid secreted are still further removed from the natural and healthy conditions, and rendered more injurious to the œconomy, and much less capable of restoration to states compatible with the continuance of life. *Secondly*. The continued access of the air will give rise to the thickening of the false membrane, and thereby prevent the lung from expanding, whilst it will render the secretion at first purulent and afterwards offensive and irritating to the surfaces containing it, and consecutively most contaminating to the circulation and whole frame. *Thirdly*. The operation performed so as to prevent the introduction of the air, although often required to be repeated, at successive periods, closing the wound carefully in the intervals, admits of the gradual agglutination of the opposite surfaces of the pleura, does not interfere with the contingent absorption of the remaining fluid, and is compatible with the continued recourse to medical treatment appropriately to the peculiar features of the case.

184. I agree so entirely with what Dr. WILLIAMS has stated as to the manner in which this operation should be performed, that I here adopt his recommendation:—"The spot for the introduction of the trocar should be determined with due reference to the physical signs; carefully avoiding every part where, or near which there is sound of respiration, voice, or not perfect dulness on percussion. A projection or fluctuation of an intercostal space give greater eligibility to a spot; and these circumstances present themselves most frequently at the inferior lateral parts of the chest, from the third to the seventh rib, where also the soft walls of the chest are as thin as anywhere. In all cases it is a proper precaution to pass a grooved needle first, as recommended by Dr. T. DAVIES; for this at once determines the pressure of the fluid, its quality, and the thickness of the walls which contain it at that spot." The upper margin of the fifth or sixth rib offers most commonly the most favourable situation, avoiding of course the immediate vicinity of the known arteries and nerves, and especially of the heart, with reference to displacement, &c. "The patient should be lying on his back, inclining to the affected side, and not more raised than is necessary to the state of his breathing. The skin should be drawn aside, so that the puncture through it may not, after the trocar is withdrawn, correspond with that of the pleura, but form a valvular orifice. The trocar should not be pushed in further than is necessary to clear the parietes, but the canula may be pushed further after the stilette is withdrawn, and its sides should have several holes in them. As soon as the stilette is withdrawn, steady pressure should be applied by a bandage, or by the hands of an assistant, to depress the shoulder and sides, and to push up the diaphragm on the affected side, to promote the flow of liquid and to prevent the introduction of air through the orifice during any sudden or forcible act of inspiration. For the same reason, during a fit of coughing, if there appear any tendency to intermission in the stream of fluid, the orifice should be closed by the finger. The pressure should be steadily increased as the liquid flows; and if the stream should stop, a probe may be passed through the canula to clear it of clots of lymph or other obstructing matter; but if still no more flows, a compress, or if the liquid is purulent a large poultice should be placed on the orifice; and then, and not till then, the pressure on the walls of the chest may be discontinued. The result will be, that the walls of the chest, expanding by their own elasticity on the removal of the pressure, will draw air into the compressed lung, which, being thus inflated, will begin to resume its part in the function of respiration and circulation, and will thus promote the absorption of the rest of the fluid, and improve the condition of the whole system. Even if the fluid should reaccumulate, the temporary expansion of the lung will have served to restore its natural properties, so that when another quantity of fluid is again withdrawn, the organ will be better prepared for a restoration of its functions." (p. 28.)

185. Performed in the manner thus judiciously advised by Dr. WILLIAMS, the operation is free from risk, and will seldom fail to give relief. If the collection be purulent it will often be necessary to repeat the operation several times; but if it be serous, one tapping, which will more or less expand the lung, will often be sufficient to give a turn to the disease, the complete removal of the effused fluid being effected by nature, aided by appropriate remedies. When the fluid is purulent Dr. WILLIAMS recommends the injection of warm water with the view of displacing it; but instead of doing this with a single tube, it should be done through a double-tubed canula, the tube for injection being cautiously carried two or three inches into the chest, whilst the evacuating tube is merely long enough to pass through the walls. If warm distilled water be then thrown in by a syringe through the longer tube, it will drive the matter off through the shorter tube, and in this way the morbid secretion will be displaced by water, which is much more likely to be absorbed. If, after repeated evacuations there be no apparent disposition to the expansion of the lung or contraction of the chest, and matter continues to be secreted, the writer now quoted advises a recourse to medicated injections, "such as a very weak solution of nitrate of silver, or chloride of soda." I have no experience of medicated injections in these circumstances; but I see no reason against a cautious recourse to them. The pleural sac may be treated, in these cases, as an abscess; and, if the discharge be unhealthy, we should endeavour to correct it, and to promote the healing of the diseased surface by such means as are found beneficial in analogous circumstances. When the discharge is fœtid, it may be washed out, in the way just advised, by antiseptic injections, especially by chlorinated solutions, or fluids containing creasote. "The same practice may be advantageously pursued when the matter has pointed, and opened spontaneously, leaving a fistula which may remain open for months or even years. Dr. TOWNSEND mentions the remarkable case of Dr. WANDELSTADT, who had been tapped thirteen years before, since which time the wound had remained open

and discharged daily from half a drachm to four ounces. The diseased side was much contracted and did not move on breathing, yet he could blow the flute, walk fast, and actively perform his professional duties."

186. I believe that the HIPPOCRATIC method of evacuating the fluid at successive times, preventing the access of air, and closing the orifice in the intervals, is the best, because it gives the lungs time to expand, and prevents those changes in the inflamed membranes, and in the products of inflammation still retained in the pleura, that the admission of air would certainly produce. The practice of leaving the orifice open, and especially of leaving a canula in it, is attended by this mischief, namely, that the free access of air to the cavity either rekindles the inflammation of the pleura, of which the effusion had in great measure caused the resolution, or changes the character of the inflammation still remaining from an adhesive to a suppurating form, and ultimately even decomposes the matter which is formed. I have generally observed, when the access of air was allowed, that the fœtor of the discharge was most manifest in two or three days, and that all the constitutional and even the local symptoms were aggravated.

187. Several recent writers, who have advocated the propriety of operating in the circumstances already stated, have not sufficiently recognised the importance of excluding the air; and have considered that, because it has been shown by the experiments of NYSTEN and others, that air introduced into the cavity of the healthy pleura is removed in a short time by absorption without manifest detriment, no injury need be expected from its admission after this operation. But circumstances are different as regards these experiments and the operation for this disease; besides, what has been inferred from *à priori* reasoning and from analogy, has been proved by the experience of several candid observers, namely, that, although air may not affect a serous surface, when only temporarily brought in contact with this surface, it will certainly influence it, if allowed free communication with it; that, when this surface is inflamed already, the admission of air aggravates, and changes to an unfavourable form that inflammation; and that the air acts also injuriously upon the products of inflammation — both the consistent and fluid, changes their characters, decomposes them, and renders them more contaminating to the surrounding tissues. To prevent the injurious influence of air, it has been recommended to perform the operation under water, and whilst the patient is immersed in a warm bath. In certain circumstances, and more especially in the more prolonged cases, this expedient deserves attention and even adoption.

188. Some writers have advised fluid injections into the pleural cavity, with the view of expelling both the diseased effusion and the air which may have been introduced; and it is not improbable, that pure or distilled water, of the proper temperature, thus introduced, the orifice being accurately closed afterwards, may have a beneficial effect, and be absorbed, although the morbid fluid was not absorbed, owing to its nature. If this measure were adopted, it should be employed in such a manner as to wash out the morbid matter as entirely as possible; and the fluid allowed to remain should not be so much as might prevent the lung from expanding, if it still possessed this power. Of the success of medicated injections in these cases, the evidence is not sufficiently conclusive. Dr. WILLIAMS states, that Sir P. CRAMPTON used with success an injection of a weak solution of chloride of lime; but all stimulating injection must necessarily increase or perpetuate the inflammatory action in the surface, and thereby prove an obstacle to the expansion of the lung, and to the attainment of the end proposed by the injection, namely, the arrest of the effusion and the adhesion of the opposite surfaces. In some instances, however, the injurious effect may not result, whilst the beneficial effects may follow; and, therefore, such injections may be cautiously resorted to after other means have failed, and in the circumstances hereafter to be noticed (§ 189.). In this state of the disease, and on occasions which the experienced physician will duly appreciate, he will agree with CELSUS in considering that the "Anceps remedium melius est quam nullum."

189. In order to obtain the re-expansion of the lung, so much to be desired after the operation for empyema, and at the same time to increase the discharge of the accumulated fluid, it has been advised by LAENNEC and others to apply a cupping-glass with an exhausting syringe over the puncture. Some advantage might accrue from this expedient, if carefully performed; but it is not unattended by risk, both from injuring the lung by forcibly expanding it, and from allowing air to rush in through the opening, upon removing the exhausting apparatus. If these dangers could be sufficiently guarded against, the expedient might prove of service. The latter might be prevented, and the former could hardly be considered so great as to prevent a cautious recourse to it.

190. *D.* THE COMPLICATIONS OF PLEURISY necessarily involve the same principles of treatment as have been above developed. — (*a*) The most frequent complication, namely, that with *pneumonia*, forming *pleuro-pneumonia* (§§ 93. 148. *et seq.*), requires very nearly the same treatment as I have recommended for either of the diseases when occurring simply, due regard being paid to the existing diathesis or states of vascular reaction and vital resistance. In this complication, however, and more especially when the sthenic character is manifest, the preparations of *antimony*, especially tartar emetic, are more frequently beneficial, than in uncomplicated pleurisy; but they should be exhibited after bloodletting, and in the manner advised for pneumonia (see LUNGS — INFLAMMATION OF, § 96.), or in conjunction with calomel and opium as above prescribed (§§ 167. 169.); the other internal and external means advised for these maladies being employed as the circumstances of the case will suggest.

191. (*b.*) When pleurisy complicates *eruptive* or *continued fevers* (§ 94.), then the Treatment must necessarily depend upon — 1st, the character or state of the fever, — 2d, The period of the fever at which it occurs; and 3d, The states of vital energy and vascular action characterising it. In these complications, the *asthenic* diathesis should generally be suspected unless the character of the prevailing epidemic constitution and of the existing symptoms indicate the contrary, and the

plan of cure suggested above for the asthenic or cachectic forms of pleurisy (§§ 47. *et seq.*) ought therefore to be entertained with such modification as the features of individual cases may require. It very frequently happens, that the local disease is either not detected in these circumstances, or proceeds so insidiously and latently as to elude even close observation, until it has advanced far, or given rise to considerable effusion, and can admit only of the curative means which have been already recommended for the latent, the advanced, or the chronic states of the malady as the case may be (§ 173. *et seq.*). In these complications I have seen great advantage derived from the terebinthinated epithems or embrocations, and the other external remedies mentioned above (§§ 171. 175.).

192. (*c.*) The partial, adhesive and chronic states of pleurisy which so generally complicate the advanced stages of *tubercular consumption* (§ 95.), fall more legitimately under the treatment of that malady; but I may here remark, that the pleurisy which thus supervenes is not always attended by tubercular deposits, either upon the pleura or in the false membrane; although it is sometimes thus accompanied, more especially in the scrofulous diathesis, and in persons who have been exposed to depressing agents, as anxiety of mind, insufficient nourishment and clothing, and deprivation of air, exercise, and sunshine. In these circumstances also pericarditis may further complicate the malady and present a tubercular character (§ 96.). In both these forms of complication, the friction sound is often heard on auscultation, and then the nature of the mischief may be inferred with tolerable certainty, especially in the circumstances just stated. The treatment cannot be expected to be satisfactory in these cases, some of which are attended by either more or less anæmia or cachexia; but life may be prolonged for a very considerable period, even if it may not be saved, by a judicious recourse to chalybeate preparations, more especially to the iodide of iron with sarza, alternating this course with very minute doses of the bichloride of mercury prescribed in tonic decoctions or tinctures, &c.

193. (*d.*) In the complication of pleurisy with *hepatitis* (§ 98.), and in that with *peritonitis* (§§ 99, 100.), the associated malady usually presents an acute character, which may pass into the chronic form if not promptly and actively treated. In these complicated states of disease, the means which are most serviceable are not materially different from those advised for the acute form of either of these uncomplicated diseases. It is generally of great importance to bring the system under the influence of mercury before effusion takes place or proceeds far, — and this may be done by either the internal or the external use of the mineral, or by both modes, according to circumstances. In a case of remarkable urgency, to which I was recently called, a large blister was applied somewhat below the seat of suffering, after bloodletting was carried as far as appeared prudent; free vesication was promoted by warm poultices; and, after the cuticle was removed, the mild mercurial ointment was applied, and covered by a warm bread-and-water poultice. The most beneficial results were soon afterwards observed, and the patient rapidly recovered. In these complications, the terebinthinate epithems and embrocation, advised above (§ 171.), are often of great service, when judiciously employed and aided by the additional means which the state of the case will suggest.

194. In some of the complications of pleurisy just noticed, *paracentesis thoracis* can furnish only temporary relief; in others it may be most beneficial, whilst in a few it cannot be attempted with any sufficient prospect of advantage. It is not merely the complication which ought to be considered, but also every circumstance connected with the case, and more especially those connected with the primary malady, of which the pleuritic attack is the consequence. When this operation appears at all admissible, in any of these associations, it should be resorted to as early as possible; for the several lesions mentioned above (§ 101.) may soon be caused by the pressure of the effused fluid, and further complicate a disease which an operation promptly performed might have removed.

195. *E.* IN THE DARK RACES (§ 102.), pleurisy should be treated as I have advised for the asthenic and complicated forms already considered. Whether it assumes an *acute* or a *chronic* character in these races, I have always seen it more or less latent, complicated, and consecutive, more especially of tubercles of the lungs, — tubercles having been found also on the surface of, or below the pleura, or in the false membranes after death (§ 102.). When the effusion is great, paracentesis should be early employed. The few cases of this disease, which I have seen in these races, have not been so much benefited by treatment as the natives of cold or temperate climates; but this was partly attributed to the unfavourable circumstances in which they were placed, and to the influence of a temperature and climate different from that to which they are suited by their organisation.

196. *F.* PLEURISY IN INFANTS AND CHILDREN (§ 103.), requires the same measures as I have advised for adults, due reference being had to age and to the susceptibility of the influence of certain remedies connected with infancy. In this class of subjects, pleurisy is most frequently consecutive and complicated, and the treatment should be prescribed accordingly. For very young children especially, some remedies which are most beneficial for adults with this disease should either not be employed at all, or with great caution. The chief of these are opium and other narcotics, tartar emetic, and blisters; but calomel may be given freely without risk, with small doses of James's Powder, vascular depletions being promptly employed, and to an extent which the circumstances of the case will warrant. The terebinthinate epithem or embrocation will prove of great service, and will be attended by no risk, unless the utmost neglect be evinced. If the application of a blister be considered advisable, with the view of obtaining a discharge from the external parietes of the chest, it should not be continued longer than three or four hours, or until slight redness of the surface is caused by it, when a warm bread-and-water poultice should be applied, which will usually produce vesication without subsequent risk, if due attention be paid to the case.

197. In the acute stage of the malady, the treatment now advised, aided by diaphoretics and diuretics, should mainly be trusted to; but, as the chronic stage advances, and particularly as effu-

sion increases, the iodide of potassium may be prescribed, with liquor potassæ and some preparation of sarza, or with the addition also of a diuretic; the terebinthinate liniment, or a liniment containing the iodine of lead, or iodine of potassium, being occasionally applied to the side, or the emplastrum ammoniaci cum hydrargyro, or equal parts of this plaster and of the emplastrum picis comp. If the patient evince a marked debility, or cachexia, anæmia, or constitutional vice in the chronic stage, the iodide of iron should be given in the syrup of sarza, and change of air, especially to the sea-side, be recommended; the external applications just mentioned, or the frequent sponging of the surface with warm salt-water, or with a tolerably strong solution of bay-salt in warm water, or the use of these alternately, being also resorted to. If effusion be considerable, especially if the patient live in a large town, change of air to the country, aided by suitable alterative and diuretic medicine, will generally remove the disease, unless it have become complicated, or the vital powers be very depressed, and the constitution cachectic.

198. Treatment, judiciously directed, is generally much more efficacious in this class of patients, than in persons advanced in age, or even in adults; and the more serious consequences of the disease, as empyema, with or without fistulous opening, should not be considered hopeless, unless complicated disorganisation exists. Whenever the effusion appears to be puriform, no delay in resorting to paracentesis thoracis should take place in children, more than in adults; and in the former especially, it is hardly ever too late to perform this operation, particularly when the effusion is of this kind.

199. iii. DIET AND REGIMEN.—It is almost unnecessary to add anything on this topic, as it must be evident, that both the diet and the regimen should be strictly antiphlogistic, during the acute stage, more especially when the disease presents a sthenic character. As effusion advances, or becomes chronic, and especially if vital resistance be weak, it will often be necessary to support the powers of life with such means as will the least excite vascular action or accelerate respiration, and at the same time tend to increase the natural secretions and excretions. This becomes the more requisite in the scrofulous diathesis, or when the effusion is puriform, and attempts to discharge and prevent the return of the effusion are being made. But there is no aid to a judicious treatment that deserves more general adoption, than change of climate, especially to the sea-side, to a mild air, and to a dry situation. A person who is recovering from pleurisy should guard, both during convalescence and for a long time afterwards, against currents of cold air; against wet, cold, or damp feet; and against errors in diet; and he ought more especially to avoid standing upon cold stones, or floor-cloth, or in damp places. His shoes ought also to be changed after walking, immediately upon returning home.

200. XII. STRUCTURAL CHANGES OF THE PLEURA NOT NECESSARILY ARISING FROM INFLAMMATION.

CLASSIF.—IV. CLASS.—II. ORDER. (*Author in Preface.*)

1. DEFIN.—*Lesions of the pleura not necessarily depending upon, although frequently associated with, inflammatory action, but often arising from diathesis, or constitutional vice or contamination, and seldom attended by distinct signs, although their presence sometimes may be inferred from the history of the case, and from various local and general symptoms.*

201. i. DESCRIPTION.—I have so fully described those lesions of the pleura resulting from inflammation (§§ 112. *et seq.*), that I cannot further advert to them than to briefly notice some of their associations with those alterations about to be considered. Certain lesions which I shall point out doubtless originate, in most cases, if not in all, in inflammatory action; but they subsequently undergo changes, which may be referred to morbid nutrition, this nutrition giving rise, either *to a transformation of the tissue to one of a different nature—to the transition of this tissue to another different from it, but not foreign to the economy, or to the production of a structure altogether adventitious to the healthy frame.* It is thus that we perceive, as a consequence of pleuritis, and owing to the states and grades of action, and to the conditions of the constitution, cartilaginous or ossific deposits or transformations of the pleura, in some cases; and, in the course of this disease, owing to constitutional vice, tubercular deposits either beneath the pleura, or in the albuminous or fibrinous deposits, or false membranes on the free surface of this membrane. The former lesions most probably originate in inflammatory action, or irritation, the morbid nutrition proceeding as this action subsides; but the latter lesion is either co-ëtaneous with the inflammation, or excites it, or is a consequence of it, in the scrofulous or tubercular diathesis. The lesions more immediately as well as remotely consequent upon inflammation of the pleura have been described above (§§ 112. *et seq.*), with the exception of *gangrene, ulceration*, and *perforation* of this membrane, of which I proceed to take further notice.

202. *A. Gangrene of the pleura* occurs only on very rare occasions, and chiefly as a consequence of either gangrene of the subjacent lung, or abscess of this organ, or external to the costal pleura. A sphacelated state of the pleura may also occur in an advanced stage of chronic pleurisy or empyema in the form of gangrenous ulcers, as remarked by LAENNEC, BARON, and CHOMEL, but this is very rare. Gangrene of the pleura is generally limited to a small space, and presents the appearances of irregular patches of a brownish green, livid or very dark hue, that softens, ulcerates, and passes into a dark-greyish, dirty and irregular surface, exhaling a fœtid odour. Around these patches, indications of inflammatory action, with certain of the more usual consequences of this action, are generally observed.

203. *B. Ulceration and perforation of the pleura* are not infrequently met with, and are noticed, especially as regards their chief consequences, under the head of chronic pleurisy, and in the Article PNEUMATHORAX. They may take place under a variety of circumstances, especially when they commence, as more frequently is the case, in the attacked surface of the pleura, perforation proceeding from this surface inwards. In cases of abscess, or of tubercular softening and ulceration, or of gangrene of a superficial portion of the lung, softening and ulceration of the pleura covering this portion thus supervene, and sometimes go on to perforation. Hæmorrhage from injury or disease

of a blood-vessel, or pulmonary apoplexy, may cause rupture of the pleura, at the nearest point to the seat of effusion. Either ulceration or perforation, or rupture of the pleura, may likewise be caused by abscess seated in some place external to this membrane, as an abscess of the lungs, liver, &c.; or by hydatids, cysts, tumours, aneurisms, and injuries of any adjoining structure or part. In all these circumstances, the perforation commences in the attached surface, and advances into the pleural cavity; but it may proceed from within outwards: but this is very rarely the case unless in general or partial empyema, when the matter is evacuated either through the lungs or at some part of the thoracic parietes, as already described (§§ 87—92.).

204. *C. Effusions into the cavity of the pleura.*—Those which depend chiefly on inflammatory action have been described above (§§ 115. *et seq.*), and have been shown to consist of serous, sero-albuminous, albuminous, or plastic products, which may undergo various changes, of puriform matter, and more rarely of a sanguineous, or sero-sanguineous fluid. Those which take place independently of inflammation are simple serous or watery effusive hæmorrhages, and the passage, owing generally to perforation or rupture of the pleura, of gaseous fluids, or of purulent, gangrenous, tuberculous, or cancerous matters into the cavity.

205. (*a.*) *Watery effusions*, or *passive serous effusions*, require no further notice than they have already received, when treating of *dropsy* of the pleural cavity, they being usually independent of disease of the pleura itself (see *Art.* DROPSY, §§ 158. *et seq.*).

206. (*b.*) *Hæmorrhagic effusions* into this cavity, or *Hæmathorax*, may proceed from a hæmorrhagic form of inflammatory action implicating this membrane, characterised by deficient vital powers, and a morbid state of the blood itself; or from loss of tone of this surface and of the capillaries ramified to it; or from this state conjoined with an hæmorrhagic tendency, or from rupture of an aneurism, or injury or disease of some vessel adjoining or involving the pleura. In the former states the effusion, whether altogether sanguineous, which is very rarely the case, or sanguineo-serous, is an exudation from a greater or less extent of the pleural surface; this surface being more or less concerned in causing the effusion. In the latter, this surface is generally healthy, the blood-vessels subjacent or adjoining it being principally affected. When blood is effused into the cavity of the pleura, inflammation is usually thereby produced; and generally with a rapidity according to the quantity and purity of the blood effused, the resulting phenomena varying with the condition of the patient, and circumstances in which he is placed.

207. (*c.*) The effusion of *gaseous fluids* into the cavity of the pleura is considered in the Article PNEUMATHORAX, and of *purulent collections* I have already treated. *Tubercular* and *cancerous productions* often form within the pleura; but they also appear external to it, as well as involve its structure, as will be shown in the sequel. The passage of gangrenous, carious, ichorous, or other morbid products, from disorganisation of an adjoining part, into the cavity of the pleura, may likewise occur in the manner already stated; but, when this takes place, inflammation is thereby rapidly exerted throughout the serous surface. Simple *cysts* and *hydatids* are rarely or never formed within the pleural cavity, and are rarely developed externally to it, or, at least, in such situations as allow them to find their way into this cavity.

208. *D. Cartilaginous and osseous formations*, or transformations of the pleura are not very rarely met with. In some instances, these changes appear to exist immediately under or external to the pleura, or on its attached surface, the membrane retaining its natural structure and polished surface. In others they seem more entirely to involve the pleura, as if arising from thickening and induration of this tissue, and advancing through the fibro-cartilaginous state to osseous transformation; and in some cases they are confined entirely, or in part, to the false membranes or adhesions formed on or between the pleural surfaces. They evidently result, as noticed above (§ 201.), from a state of chronic inflammation or irritation that has passed into morbid nutrition, the fibro-cartilaginous condition being intermediate between simple thickening with induration and ossification. They have been found of various grades of thickness, from a line or two to an inch; and seated in or upon either the costal, the diaphragmatic, or the pulmonary pleura; and in some cases in the false membranes existing between and connecting these. In some instances, the transformation is neither altogether cartilaginous nor entirely osseous, bony matter, in lamellæ, or in irregular forms, and in detached patches, existing between the layers of cartilage, or otherwise irregularly deposited.

209. These productions are found either in the form of smooth plates or lamellæ, or in that of irregular nodules, or they present a rough surface, with irregular accuminations or points. They are never met with to any considerable extent in connection with the pulmonary pleura, without the subjacent lung being more or less consolidated. In rare instances, they have assumed a rounded, oval, or globular form, either with bases of varying sizes, or with narrow and short peduncles; their surfaces being smooth and shining as if still covered by the pleura. These nodules may be single, or several may exist in the same case; their magnitude varying from that of a pea to that of a large cherry.

210. *E. Fatty appendages* have been found attached to the free surface of the pleura; but very rarely, at least entirely unconnected with adhesions between the opposite surfaces. I have met with these appendages in several cases, but in all they appear to have been developed by the formation of fat underneath a portion of false membrane, and between it and the pleura; the false membrane having been of old date. In some cases, old adhesions, having a polished serous surface, and a thick or rounded form, have consisted, excepting their surfaces, entirely of fat.

211. *F. Tubercles* may be formed, either on the attached surfaces of the pleura in the sub-serous cellular tissue, or in the pleural cavity. In the former situation they chiefly consist of numerous small granulations under the pulmonary pleura, and sometimes they form more considerable masses developed beneath the costal pleura, and causing elevations of the pleural surface. Tubercles are never found within the pleural cavity, unless in connection with false membranes or adhesions, and infiltrating or studding these, as described above (§ 120.), thus constituting the *tubercular form of pleurisy*. But they may exist in both

situations in the same case, as well as in the lungs and adjoining membranes, as the pericardium, peritoneum, &c. Tubercles may be formed underneath, or upon, the attached surface of the pleura, as just described, and may advance even further in their development without any evidence of inflammatory action in their seats or vicinity. But the circumstance of their constant co-existence with certain of the products of inflammation, when they are found within the pleural cavity, or upon the free or internal surface of the pleura, suggests the question, whether they are the *cause* or the *result* of inflammation in the tubercular diathesis? That they are merely one of the products of inflammation in this diathesis, are exuded, in a rudimental state, with the lymph produced by the inflammation, and are further developed as the organisation and other changes of that lymph advance, are circumstances rendered probable by their constant co-existence with these products; whilst the opposite doctrine, that they are the causes of the inflammation, and of the consequent exudation of lymph in which they are enveloped, necessarily allows that they are first thrown out or formed upon the free serous surface, where they excite the irritation and inflammation, with its consequences found in connection with them. Now if they are thus formed on the free serous surface, before inflammation is developed, it is reasonable to infer that they should be found, in some instances, before this effect is produced, or produced to an extent rendering the cause doubtful; but this has hitherto not been remarked (see § 120.).

212. *G. The several forms of malignant* or *cancerous degenerations* have been observed involving the pleura, but generally consecutively—never primarily. These lesions, whether schirrous, carcinomatous, encephaloid, or fungo-hæmatoid, when they implicate the pleura are consequent upon their existence in some other part of the œconomy, most frequently in the mamma, in the axillary glands, or in some other situation in the vicinity. They first extend to the subjacent cellular tissue, causing an irregular thickening and induration, with their characteristic forms of degeneration of this tissue, and an irregularity or unevenness of the serous surface, which ultimately becomes variously changed in colour and consistence according to the form and progress of the malady, until it altogether loses its natural hue, and is altogether involved in the malignant structure. At this advanced stage the surface and cavity of the pleura generally present more or less of a turbid, dirty, ichorous, or sero-sanguineous fluid, which is sometimes also offensive, or of a peculiar odour.

213. ii. SYMPTOMS AND SIGNS OF STRUCTURAL CHANGE OF THE PLEURA. The *symptoms* and *signs* of these changes are mostly the same as have been described above as indicating the progress and advanced stages of inflammation of this membrane. Those changes, which are essentially the result of inflammation, most necessarily present these symptoms and signs, which, in connection with the history of the case, usually show the nature, if not always the exact extent, of the disease. But those lesions which consist of adventitious formations, as regards either the situation or the œconomy, frequently advance without any distinct symptom or sign from which their existence may be inferred.

214. (*a.*) *Gangrene of the pleura* (§ 202.) being met with chiefly as a consequence of gangrene of a portion of the lung, is preceded by the indications of this occurrence. When the symptoms of gangrene of the lungs (see LUNGS, §§ 173—175.) are followed by an acute pain in the side, painful cough and inspiration, extreme anxiety and depression, followed generally by all the usual symptoms of the utmost vital exhaustion, then this lesion may be inferred. The physical signs may consist merely of dulness in percussion, of greater or less extent, with absence of the respiratory sound.

215. (*b.*) *Ulceration of the pleura* (§ 203.) is announced only when it has terminated in *perforation*. If the ulceration has proceeded from the attached surface into the cavity of the pleura, the passage of the matters, whether gangrenous, puriform, tuberculous, aëriform, &c. the patient very suddenly experiences acute pain in the side, with oppression, dyspnœa, and anxiety; and if air passes rapidly into the pleural cavity, these latter symptoms are not only sudden but also extreme, and are attended by the physical signs of *pneumathorax*. When ulceration, followed by perforation, takes an opposite course, proceeding from the internal cavity externally, as stated above (§ 203.), then the symptoms already described (§§ 87. *et seq.*) as attending *empyema*, when terminating in this way, are usually observed.

216. (*c*) *Acute or inflammatory effusions into the pleural cavity* have been already fully noticed (§§ 204—207.) as respects the symptoms and signs they produce, and passive effusions into this cavity have been elsewhere treated of (see Art. DROPSY, §§ 158. *et seq.*). Effusion of blood into this cavity, *hæmathorax*, unless when it occurs from rupture of an aneurism, or from external injury, is a rare occurrence, as shown when treating of hæmorrhage into the pleural cavity (see Art. HÆMORRHAGE, § 277.). As a pure exudation in this situation, it is very rarely met with, although the exhalation of a greater or less proportion of red particles with the serum of the blood, in some extreme cases of asthenic acute pleurisy, or of cachectic pleurisy, is not very infrequent, and constitutes the *hæmorrhagic pleurisy* of LAENNEC. *Hæmathorax*—or the effusion of blood into the pleural cavity, analogous to the hæmorrhages, active or passive, of other organs or surfaces—is so rare, that the phenomena attending, or consequent upon it have not been satisfactorily observed, and they are hence imperfectly described. But, whether the blood poured out in this situation be a primary lesion, or consecutive of some other, or of local injury, I cannot view it, with M. LAENNEC, as an occurrence devoid of importance as regards its effects upon the pleural cavity; or believe that the blood effused in this situation will be absorbed without producing inflammation in this cavity. My experience has proved that, although absorption does take place, inflammatory action, varying in character and intensity with the circumstances of the patient, is the most frequent result, as I have already shown (§ 206.). It must be admitted, that effusion of blood into the pleura will produce similar *symptoms* to those resulting from other effusions to the same amount. But it will be generally observed, that indications—either local or constitutional, or both—of inflammatory action of the pleura will sooner or later supervene; and that the products of this inflammation, mingled

with altered and nearly absorbed blood, in the pleural cavity, will give rise to peculiar appearances, on examination after death, more distinctive of the immediately antecedent inflammation, than of the hæmorrhage which developed the inflammation. I have nothing to add at this place to what I have stated above respecting the symptoms and signs of purulent or of other effusion into the pleura (§§ 63. *et seq.*), and have advanced in the Art. PNEUMATHORAX, when noticing the combination of aëriform and fluid effusions into this cavity.

217. (*d.*) *Cartilaginous* and *ossific formations* in the pleura are not indicated by symptoms or signs during life. They are merely contingent changes, occurring after chronic pleurisy, and are met with chiefly in persons who have lived for a considerable time after such attacks, with more or less disorder of the respiratory functions, and probably with dulness on percussion, or with imperfect or absent respiratory murmur; and although their existence may possibly be in some instances suspected during life, they are unattended by any peculiar symptom or indication.

218. (*e.*) *Tubercles* formed immediately beneath the pleura, occasioning small or irregular elevations of the membrane (§ 211.), without much effusion, are generally attended by a rubbing sound during respiration; but if effusion exist, or if the tubercles be deposited in false membranes, their presence can be suspected only, and chiefly from the co-existence of the pleuritic lesion with tubercular consumption, or from the occurrence of this lesion in the scrofulous diathesis. Tubercular formations are most frequently found in one side only, in the same case, but they may exist in both cavities; and they may be present in both the pleura and in the pericardium. When this latter complication occurs, without much effusion within the pericardium, there is generally a cardiac rubbing sound in connection with a similar sound during respiration.

219. (*f*) *Cancerous or malignant alterations* in the pleura may be inferred from the gradual, nearly latent, and chronic or sub-acute form, in which the pleuritic affection supervenes upon malignant diseases of the mamma, or in the vicinity of the thorax; and from the presence of symptoms and physical signs similar to those attending tubercular formations in this membrane. The rubbing sound generally continues for a considerable period, and until the subsequent effusion becomes copious; and the pleuritic symptoms appear chiefly when the cachexia attending the cancerous malady is well marked, and the system manifests more or less of the usually accompanying anæmia.

220. iii. TREATMENT. The treatment of the organic lesions of the pleura now passed under review should be directed entirely by the circumstances of the case, and by the evidence furnished of their individual existence, and of their morbid associations.—(*a.*) If there be reason to infer the supervention of *gangrene* of this membrane, treatment is then very rarely of any further avail than to prolong existence for a few hours, or at most a day or two; and this object can be attained only by the exhibition of restoratives, &c., as camphor, ammonia, quinine, myrrh, ammoniacum, &c.; for, although recovery from gangrene of the substance of the lungs may take place by the aid of these or similar means, it is very rarely procured when this lesion has extended to the pleura.

221. (*b.*) As to the treatment of *ulceration and perforation* of, and *effusions* into, the pleura, I can add nothing to what I have recommended to be done for the more advanced stages, and more chronic forms of pleurisy (§§ 63. *et seq.*), for which, however, and more especially for the more simple states of effusion, the means there advised, when judiciously administered, will be often very successfully employed, especially when aided by a free use of the acetate of potash, so as to act manifestly both upon the bowels and kidneys; and by the external means above mentioned (§ 175. *et seq.*). If the causes and circumstances of the disease lead to the inference that much *blood* is effused into the pleural cavity, or that this fluid constitutes the larger part of the effusion, I believe that the operation for empyema should not be delayed, otherwise inflammation, if it have not already appeared, will certainly supervene, in a form not readily removed by treatment, inasmuch as the blood, or at least its unabsorbed portion, will remain to perpetuate the disease, and favour the occurrence of consecutive lesions.

222. (*c.*) The treatment of the *other organic lesions* of the pleura promises but few advantages when their presence are even presumed. *Tubercles* are very rarely present in this membrane, without existing in still greater abundance, and often in advanced states, in the lungs or other structures. Hence the treatment requires to be directed in many cases more to these organs than to this special lesion; and, even when the features of the case warrant the direction of remedies principally to this seat of disease, it will be difficult to suggest others more likely to be beneficial than those advised above for chronic pleurisy (§§ 175—179.). The mistura ferri composita, the iodide of potassium, the iodide of iron, the liquor potassæ with tonic infusions and sarsaparilla, or these variously combined, or conjoined with such other substances as the peculiar circumstances of the case will suggest, are most generally appropriate, for these lesions, as well as for the effusions into the pleural cavity, by which these lesions are often attended, especially when aided by suitable means for the promotion of the alimentary and renal evacuations, and by external derivatives.

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PLEURODYNIA—Synon.—*Pleuralgia, Pleurodynia* (from πλευρά, the side, and ὀδύνη, pain); *Pleuritis spuria, pseudo-pleuritis; Neuralgia thoracica, Pleurodyne*, Auct. Var.; *Dolor lateris; Rheumatismus Pectoris*, Naumann; *Pleurodynie, Point de Côte, Fausse Pleurésie*, Fr.; *der Seitenschmerz, der falsche Seitenstich*, Germ.

Classif.—I. Class. IV. Order (*Author*).

1. Defin.—*Pain in the side usually occurring and ceasing suddenly, independently of any physical sign of inflammation of the pleura, and generally connected with rheumatic, neuralgic, or hysterical affection.*

2. *Pleurodynia* and pleuralgia are names in no way applicable to the painful affection under consideration, inasmuch as there is no evidence in favour of the pleura being at all implicated in it, unless it change its nature, or superinduce or pass into pleurisy. If, however, the word πλευρα be viewed, as it was by the ancients, as meaning the side, without reference to any particular part or structure of the side, these terms will appear much less objectionable. That this affection is not always rheumatism of the chest, as implied in the name given to it by Naumann, is a fact which experience will soon teach the inexperienced. Nor should it be viewed, as it has been by M. Jolly and others, as inflammation of one or more of the muscles of the thorax. But it is often connected with rheumatism, either in some other part of the body, or with the rheumatic diathesis; and it may be converted or pass into inflammation of the pleura, or of the pericardium, owing either to the predisposition and constitution of the patient, or to injudicious treatment. When it thus presents a rheumatic character, then it is to be viewed and treated as I have advised in the article Rheumatism, although it is by no means demonstrated, however frequently it has been assumed, that the pain constituting the principal feature of the disorder is caused by an affection of the intercostal muscles, or of the fibrous fascia lining the chest.

3. I. Causes.—Persons of a nervous susceptible or irritable temperament; of the rheumatic and hysterical diathesis; those who are exposed to atmospheric vicissitudes, to currents of cold air, to marshy or humid exhalations, or to cold or wet in any way, and those who live in damp, cold, and low houses, or in cellars, &c., are the most liable to experience those rheumatic and neuralgic affections in the side, which have generally received the name of pleurodynia. Owing to the greater exposure of males than females to these causes, the former are most liable to them; and adults and aged persons are more frequently affected than children and young persons. But all the

causes of inordinate excitement, and of exhaustion or direct depression of the nervous system, both predispose to, and more immediately occasion, painful affections in either side as well as in other parts of the body. Owing to the prevalence of the above causes, especially those which proceed from season, climate, and the soil and water of a locality, pleuralgic affections may be so prevalent as to be *endemic*, but they can rarely be considered as epidemic, or as being so generally prevalent, even in those localities, as to deserve that character.

4. II. DESCRIPTION.—Pleurodynia varies much in character with the causes which produce it, and according as it occurs in a *rheumatic, neuralgic*, or *hysterical* diathesis, or presents either of these forms.—(*a*) In the first of these forms, it may be either acute or chronic; in the former, it is sudden, severe, lancinating, increased upon pressure, even upon the slightest pressure or contraction of the affected muscles. It often ceases as suddenly as it appeared, the pain shifting, or having shifted, to some other part. This more acute state of the affection is frequently attended by more or less fever, and the other phenomena of acute rheumatism. The chronic state is generally prolonged for many days—sometimes subsiding altogether for a time, and then suddenly recurring either in the same place, or in the vicinity. It occasionally ceases during the day and recurs at night; or it disappears when warm in bed, to return at some period of the day. The pain is exacerbated during respiration; but this may take place either during inspiration or expiration only or chiefly, according as the muscles and nerves supplying be inspiratory or expiratory. Coughing, sneezing, and all movements which affect the muscles, occasion a sharp or cutting pain of the part.

5. (*b*.) The *hysterical* and *neuralgic forms of pleurodynia* are more manifestly seated in the sentient nerves than the rheumatic, and are referred chiefly to some part between the sternum and spine. They are often connected with irritation about the origin of the dorsal nerves, or in the ganglionated roots of these nerves; this irritation, whether functional or inflammatory, being either seated there, or reflected thence from the renal or sexual ganglia, or nerves, or from the uterus and ovaria. These forms of pleurodynia are much more frequent in adult females than in males; in the nervous and irritable temperament; in persons who are subjects of anæmia, or who are liable to irregular determinations or distributions of blood; and in those especially about the period of the catamenia, and when this discharge is irregular, difficult, scanty, or interrupted. (See Art. HYSTERIA, §§ 78. *et seq.*, and NEURALGIA, §§ 89. *et seq.*)

6. (*c*.) Occasionally cases occur in which the pain cannot be referred either to rheumatism or to any neuralgic or hysterical condition; but rather to *disorder* of some one of the *digestive viscera*—to either the stomach, the duodenum, the colon, or the liver. In these cases *flatulence* is a very prominent symptom, the pleurodynia being entirely sympathetic of the distension or irritation caused by the flatus contained in one or more of these viscera. But, in addition to this symptom, other indications of disorder of the digestive organs are usually present, especially a loaded tongue, the edges being red or flabby; an irregular and flatulent state of the bowels, and an unhealthy condition of the secretions and excretions. These symptoms are, however, often present in the other forms of pleurodynia, but they exist in this generally in a very prominent manner, and without any evidence of rheumatism, or of hysteria having been previously complained of.

7. III. The DIAGNOSIS of pleurodynia rests upon—1st, the phenomena immediately connected with the painful affection; and 2d, the absence of the symptoms and physical signs of pleuritic, pericardiac and pulmonary disease. If pleurodynia occur in connexion with rheumatism or in the rheumatic diathesis, or if the patient be subject to any form of hysterical affection, or furnish any indication of spinal irritation, or be liable to disorder of the catamenial discharge, then it may be suspected that the pain is independent of inflammation of the pleura or lungs; but the suspicion can be confirmed only by a careful examination of the chest by percussion and auscultation, and by the absence of the physical signs attending inflammatory or structural diseases of the thoracic viscera. The negative evidence thus furnished, the absence of many of the rational symptoms of these diseases, the manifest nervous or rheumatic or dyspeptic character of the affection, and the several causes or circumstances which appear to have produced it, will generally guide the careful observer to a correct conclusion as to its nature and morbid relations.

8. IV. The TREATMENT should depend upon the conclusion thus arrived at. If the affection be manifestly rheumatic, the treatment advised for RHEUMATISM is required; and if the patient be young, robust, plethoric, &c., a moderate bleeding from the arm, or the application of leeches to the side, may precede other remedies. When the pain seems to depend upon disorder of the digestive organs, or upon biliary or other colluvies, then a suitable but smart emetic, followed, after an interval, by chologogue aperients, by a warm bath, and by diaphoretics, will generally remove it. As this affection is merely the manifestation of a disorder seated more internally or deeply, the suppression of it by external applications should be avoided, until the primary affection is removed by a treatment directed to it entirely or chiefly; and when all disordered secretions and excretions are removed, and when the functions and tone of the digestive organs are restored, then whatever of painful affection may remain may be treated by rubefacient and anodyne embrocations or applications, by tonics, and the other means advised for NEURALGIA. The treatment should in every respect be directed conformably with the morbid relations which the case may present. The very general connexion existing, in females, between this affection and disorder of the catamenia requires that treatment should be more especially directed to the removal of that disorder. In this form of the affection, as well as in every other, the intentions and means of cure should have for their objects the precise origin of this and of its associated evils, and the removal of the source of them just adverted to, for as long as it exists the symptomatic effects will recur again and again, or whenever circumstances favour their evolution.

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PNEUMATHORAX. — SYNON. — *Pneumothorax*, Itard; — *Pneumathorax* (from Πνεῦμα, air, and Θώραξ, the chest); — *Pneumatothorax*; — *die Luftbrust*, Germ.; — *Pneumothorax*, Fr. CLASSIF. — IV. CLASS. II. ORDER (*See Preface*).

1. DEFIN. — *The presence of air in the pleural cavity, occasioning collapse or compression of the lung, extreme dyspnœa and anxiety, and obvious physical phenomena.*

2. I. PATHOLOGY OF. — Pneumathorax is the consequence of lesions, generally of both the lungs and the pleura, or rather of the lung implicating the pleura, allowing the irruption of air into the pleural cavity, and thereby suddenly occasioning severe circumscribed pain in one side, great anxiety and extreme dyspnœa. It may occur at any period of the course of phthisis; and, as in one case in my practice, it may even take place before the patient has complained, or had recourse to medical aid. This dangerous and generally fatal result of pulmonary tubercles has attracted attention only in modern times. It is usually developed as follows: —

3. (*a.*) A tubercular cavity may extend to the pleura, inflame, and ultimately perforate, this membrane, before adhesions have formed between the opposite surfaces, and thus the air will pass into the cavity of the pleura. This is the most common way in which pneumathorax occurs. — (*b.*) One or more tubercles may form so close to the pleura as to perforate this membrane, and open into a minute bronchus, in the course of softening, even at an early period of the pulmonary disease, and without having produced a limited inflammation of the pleura, or adhesion of the opposite surfaces, at least in a sufficient degree to prevent the passage of air into the cavity of the pleura. This, however, does not occur so frequently as the former; yet I have met with two cases. — (*c.*) In the course of partial pleurisy, the absorption of the contained fluid may leave a void, which is not occupied either by a contraction of the parietes of the chest nor by the lung, which continues either condensed, or bound down by adhesions or false membranes. This vacuum, which may be either very small or more considerable, contains air secreted by the surfaces, by which the fluid was absorbed. Dr. WILLIAMS mentions two cases of this kind; but this is a rare form of pneumathorax. — (*d.*) It has been supposed that the products of pleurisy may undergo such changes as will develope a gaseous fluid, especially in the more cachectic states of the disease, and at an advanced period, or shortly before death. Without denying the possibility of this occurrence before death, it may be admitted to take place, in some instances, soon after death. There is not, however, sufficient evidence of this change in the effused fluids in pleurisy having supervened during life to allow of its being ranked as a variety of pneumathorax. — (*e.*) Air may also be present in the cavity of the pleura, owing to a fistulous opening through the parietes of the chest, or in consequence of a fistulous communication between this cavity and the bronchi on the one hand, and the external surface on the other.

4. The intimate adhesions which usually form between the pleura covering the tuberculated portion of lung and the costal pleura obviate the occurrence of pneumathorax; yet when these adhesions either do not take place, or when they are either incomplete or not intimate, and the softened tubercles or the extending ulceration perforates the pleura, then the air passes into the cavity, distends it, compresses the lung, and gives rise to the symptoms and physical signs of this organic mischief. Most frequently the resulting perforations are small, consisting of an oval aperture, or small fissure, three or four lines long, frequently in the midst of a soft, dirty, greyish, or yellowish texture, which is easily torn. There is usually only one perforation; but several in the same case have sometimes been met with. The perforation occurs in about five-sixths of the cases, near the angles of the third or fourth ribs; that is, in a place corresponding with that where pain was felt, and where pleuritic adhesions, when not general, commonly terminate. In other cases it is more or less distant from the apex of the lung; but it very rarely takes place at the apex, owing to the frequency of adhesions in this situation.

5. Perforation of the pleura, occasioning pneumathorax, is much more frequent on the left than on the right side. This is probably owing to the somewhat more frequent occurrence, and the more advanced progress, of tubercular ulceration in the left than in the right lung. Dr. REYNAUD found, in forty cases of perforation, ascertained by post-mortem examination, that this lesion was twenty-seven times on the left side, and thirteen times on the right; and in ten similar cases, not demonstrated by examination after death, the left side was affected in six cases, and the right in four. Dr. HASSE met with pneumathorax nine times on the left and seven times on the right side. M. LOUIS observed this lesion seven times on the left side out of the first eight cases which occurred to him.

6. The perforation generally depends upon the progress of ulceration, usually tubercular, very rarely gangrenous, through the pleura. In ordinary circumstances, when ulceration approaches the pleura, inflammation, with the exudation of plastic lymph, supervenes at that part of this membrane which is nearest the ulcerated cavity, and protects that part of it, either by covering it with a thick false membrane, or by uniting it to the opposite surface by this medium. If a firm adhesion of the surfaces has formed, and the ulceration proceeds, perforation of both the pleura and the false membrane takes place without being followed by pneumathorax; and even the parietes of the chest may ultimately be perforated, the adhesions of the pleural surfaces around the fistulous perforation preventing the air from passing into the cavity of the pleura. But in other cases, especially when either vital power and resistance are weak, or the lymph thrown out is of an unhealthy or unorganizable character, and hence neither false membranes nor intimate adhesions are formed, or are not formed in a state sufficient to protect the ulcerated surface, the air passes into the cavity of the pleura, at one or more points, upon sudden efforts, or severe fits of cough. Ulceration may advance until the pleura is nearly perforated, either without the production of a false membrane or of adhesion, or with these in a more or less incomplete state, when a severe fit of coughing, or a forced inspiration, or some effort, or even an external injury, causes the thinned or ulcerated point to give way suddenly, and induces all the symptoms and signs of pneumathorax.

7. II. SYMPTOMS AND SIGNS. — *A.* SYMPTOMS. — The effects of the perforation are *immediate* and *consecutive*. — (*a.*) The *immediate effect* is to admit air more or less rapidly into the cavity of the pleura, which permits the lung to assume that state of collapse, to which its natural contractile property would reduce it, by equalising the atmospheric pressure within and without it. In addition to the introduction of air and the dyspnœa thus rapidly produced, the sensibility of the part is generally also suddenly and severely excited; and with the extreme dyspnœa and pain, great anxiety is felt. The connection between the lesions and the symptoms is remarkably striking. The pain corresponds with the rupture of the thinned portion of pleura and the irruption of the tuberculous matter into the pleura, and is caused by these occurrences; while the threatened suffocation and anxiety are the effects of the rapid passage of air and of some fluid matter into the pleural cavity. Therefore, when acute pain, oppressed breathing, extreme anxiety, and the symptoms of acute pleurisy, display themselves *suddenly* in one side of the chest of a tubercular or phthisical patient, we may suspect the occurrence of perforation of the pleura, and ascertain the presence of pneumathorax by examining the chest.

8. (*b.*) The *consecutive effects* of perforation vary in different cases. Although perforation of the pleura will not fail to allow air to pass into the cavity, yet the size and other conditions of the opening modify the amount of air introduced, and the effects which follow. If the perforation be very small, or if it be so placed that the walls of the chest close it upon expiration, or if it be below the level of the effused fluid, or if the opening be of such a form as to become valvular, and to close the aperture on expiration, air will pass into the cavity in accumulating quantity, and occasion an increased compression of the lung; and even suffocation in the course of a few hours, and before many of the consequences observed, in cases of longer duration, can take place. When, however, the termination of the mischief is not so rapid, the presence of air in a cavity neither accustomed to, nor organised for it, and of the matters which pass along with the air from the ulcerated cavity, excite with more or less rapidity great irritation and inflammation of the pleura, attended by acute pain, dry cough, dyspnœa, spasms of the intercostal muscles; quick, weak, or irregular pulse; heat of skin, and all the symptoms of acute pleurisy, with the physical signs of pneumathorax (§ 11.), and of liquid effusion accompanying the air contained in the pleural sac.

9. When the aperture, by which air passes into the cavity of the pleura, is large, there is a frequent renewal of the air in this cavity; for the lung is kept in a state merely of collapse, and not of forcible compression; the air passing out of the cavity, as well as passing in, to a partial amount. The consequences are, a more copious purulent secretion takes place from the pleural surface, and this secretion always becomes more or less fœtid if it continue for some time. The foregoing symptoms, however, are not of themselves sufficient to show the existence of pneumathorax; for, notwithstanding the sudden supervention of acute pain in the side, with oppressive dyspnœa and anxiety, and although, in some instances, these symptoms may be instantly felt after a fit of coughing, or upon exertion when the patient has felt as if something had given way in the pained place, still all these phenomena may exist in some acute cases of pleurisy, without any perforation; whilst, on the other hand, perforation and pneumathorax may take place without any very acute or suddenly developed symptoms, although this is seldom observed. The physical signs, therefore, are chiefly to be depended upon for the diagnosis of this lesion.

10. When the quantity of air which is passed into the pleural cavity is great, if there be no adhesions between the opposite surfaces of the pleura, or if these adhesions be inconsiderable or admit of being much stretched, the lung is compressed and forced against or towards the spinal column. At the same time the thoracic parietes on the affected side are distended, the ribs separated, the diaphragm depressed, and the mediastinum pushed to the opposite side. The widening of the intercostal spaces, the rounding and dilatation of the parietes, the much less degree of motion during respiration, and the much greater dimensions of the affected side upon admeasurement, sufficiently indicate the distension of the pleural cavity by the accumulation of a fluid; the nature of the fluid, whether gaseous or liquid, being readily indicated by the physical signs. The viscera are also displaced by the contained air. The heart and mediastinum are pushed to the right side, if the left be the seat of lesion; and towards the left axilla, if the right is so affected and if the air be in great quantity, whilst the liver and stomach are pushed downwards; the upper regions of the abdomen sometimes protruding more or less.

11. *B.* THE PHYSICAL SIGNS are the most important of the *consecutive effects* of pneumathorax, and are generally very distinctive. The air contained in the pleural cavity gives the walls of the chest a greater degree of resonance on percussion than when the structure of the lung is naturally distended with air. According as the quantity of air is great, so is the sound produced by percussion the more hollow or drum-like, owing to the further removal of the collapsed or compressed lung from the parietes of the chest, and to the diminished entrance of air into the lung. Hence pneumathorax may instantly be detected by a remarkable contrast of physical signs, namely, by a very hollow or clear sound on percussion of the affected side, with little or no vesicular sound of respiration, whilst the healthy side gives a duller sound on percussion, but a much more distinct respiratory murmur.

12. Perforation of the pleura, and its consequences, pneumathorax, and the effusion of fluid, give rise to other phenomena which are further *diagnostic* of these lesions. These are the *sounds* which have been termed the *metallic tinkling sound*, the *amphoric sound*, and the *sound of fluctuation*.

13. (*a.*) *Metallic tinkling* has been variously accounted for by several writers, but none of the explanations, and some of them have been sufficiently singular, and others equally laborious, appears satisfactory. This sound is heard most distinctly when the pleura is perforated, when much air is enclosed in the pleural cavity, and when there is also some fluid effused. It seems to proceed from the air passing, during inspiration, through the pleural orifice of the perforation,

which, being partially obstructed by fluid or mucus, occasions a noise similar to that produced by the breaking of a bubble of air contained by an albuminous or other fluid, and the vibrations, being propagated through the inclosed air, give rise to the *clink*, or *metallic sound* or *tinkling* in question. According to this explanation, although perforation of the pleura most commonly causes this sound, it may nevertheless be heard in other circumstances in which air is contained in the pleural cavity, provided that, during respiration, the air in struggling through a fluid forms bubbles, which, breaking on the surface of the fluid, causes a vibration which is propagated throughout the included air. From this it will follow, that whatever occasions such a degree of motion of the parietes of the chest, even *percussion* during the physical examination of this cavity, may occasionally develope this sound, which has so long puzzled many stethoscopists, which has mystified others, and which has concerned some but little who have paraded the stethoscope as a most serviceable instrument of charlatanry and humbug.

14. (*b.*) The *tinkling sound* may thus present several modifications. Where the perforation is protected or obstructed by its position against the walls of the chest or below the level of the fluid, the tinkling may not be heard unless upon coughing or taking a full inspiration, so as to cause bubbles to be formed in the affused fluid. But the smallness of the perforation, provided that air passes through, will not prevent or obscure the sound, as Dr. WILLIAMS has supposed. "When the orifice is large and free, the air will pass in and out in ordinary breathing, and will produce in its vicinity a sound like that of blowing into the mouth of a glass bottle," or the bung-hole of a small cask, and hence this sound has been called *amphoric*. In these cases the diseased lung is merely collapsed, not compressed by the accumulation of air in the cavity as when the perforation is small, and as it is described above (§§ 8—10).

15. The tinkling or metallic sound may be heard only in certain parts of the chest — only where the lung is non-adherent, and where the effused liquid does not reach — only where a cavity is distended by air so as to give the parietes of the cavity a certain degree of tension, and to furnish the condition upon which the sound chiefly depends. In the sitting posture, this sound is heard best about the mamma, and lower part of the axilla and scapula; but in those cases in which the accumulation of air and the distension of the parietes are the greatest, it may be heard in every part of the affected side; whilst in others, where the collection of air is small, it may be heard only at one spot.

16. When there is a liquid effused into the pleural cavity as well as air contained in it, the diagnosis is generally easy. Percussion shows the level to which the liquid rises, according as it varies with the position of the patient. The motions of the liquid, also, especially upon coughing, will also often give evidence of the presence of air in the cavity. Dr. WILLIAMS has stated that, "on change of posture and on coughing, the liquid will sometimes drop from the parts which have just been immersed; and the sound of this will exhibit the metallic ringing in so distinct a manner, that it resembles the note which a glass or porcelain vessel yields when struck." (p. 132.) I think that Dr. WILLIAMS is mistaken in this; for, however change of position may produce this sound, whether as I have explained it or otherwise, I am certain that no dropping takes place, or can possibly take place, in the physical circumstances of the parts; but that, in all changes of position which can possibly be made, however extreme or opposite, the fluid will merely run down the parietes of the cavity, without dropping in any part.

17. (*c.*) If the patient be shaken forcibly, or if he give the trunk a jerk, or an abrupt turn or shake, the sound, which was first mentioned by HIPPOCRATES as resembling the *splashing* of water, will be distinctly heard. This sign has been aptly termed *Hippocratic fluctuation*, and is heard when the ear is applied to the side at the time of *succussion*; the tinkling sound being also heard to accompany or to follow it, as the air bubbles break on the surface of the fluid or at the pleural orifice of the perforation. Fluctuation or splashing is best heard when there is much air in the cavity and a moderate or considerable quantity of liquid. Percussion will frequently indicate the proportions, if carefully performed.

18. III. The PROGNOSIS of pneumathorax is very unfavourable, not so much as regards the presence of the air in the pleural cavity, as the lesions of which it is the consequence. Pneumathorax most frequently, especially when supervening at an advanced stage of tubercular consumption, rapidly hastens a fatal termination; but in more favourable circumstances, or earlier stages of that malady, life may be prolonged for some indefinite time after its occurrence; rarely, however, for a longer period than a few months. Dr. HOUGHTON has recorded a case of a bricklayer, who lived eighteen months after perforation had taken place, and who might have lived longer if he had not imprudently exposed himself in his business, for the signs of a cavity had disappeared, the side had contracted, and his general health had much improved. Dr. STOKES has adduced the case of a gentleman, who lived for many months, and who generally heard a splashing noise in his chest when on horseback. CAMBALUSIER and LAENNEC refer to cases which they consider to have recovered; but upon insufficient evidence. Dr. WILLIAMS states, that he has seen "two cases leave the hospital with the impression that they were nearly well, having gained flesh and lost the worst phthisical symptoms after the first severe consequences of the perforation had subsided." (p. 133.) My experience leads me to conclude, that, when the tuberculous disease is limited, when perforation occurs at an early state of that disease, and when the constitutional powers of the patient are not much impaired — circumstances in which perforation rarely takes place — then life may be prolonged for a considerable period, if a cure even may not be effected. For it is not impossible for a superficial tubercle, or very small cavity, to perforate the pleura, and, by such perforation, or the rupture of the nearly perforated pleura, to allow the passage of air into the pleural cavity, the compression of the lung, and the exudation of lymph upon the surface of the perforated membrane, favouring the diminution or obliteration of the cavity, and the occlusion, or even the cicatrisation of the aperture. In these circumstances, therefore, it is not unreasonable to hope for a considerable prolongation of

life, even although complete recovery may not take place. M. LAENNEC has adduced an instance in which the patient lived six years after pneumathorax appeared; and M. CHOMEL has considered perfect recovery not impossible, the parietes of the chest falling inwards, as in recovery from certain cases of empyema (see PLEURA, §§ 78.).

19. IV. TREATMENT. — This should vary with the several circumstances under which perforation or rupture of the pleura and the passage of air into the pleural cavity take place, with the period which has elapsed since the occurrence, and with the existing state of the patient. When the perforation and passage of air into the cavity have just occurred, the patient often presents many of the indications of having received a vital shock; he is pale, anxious, faint, feeble, and depressed physically and morally. At the same time he complains of oppressive dyspnœa and pain, and his pulse is rapid and feeble. In this state lowering measures would be dangerous. Gentle restoratives with opiates are chiefly indicated, as camphor or ammonia with morphia; but reaction often occurs, if the accumulation of air and the suffocative dyspnœa (§§ 8. *et seq.*) prevent not its supervention. Nevertheless, the irritation and inflammation of the pleura produced by the air are generally attended by some indication of re-action after some hours, although this may be imperfect, or but slightly developed. The pain which is complained of should not be considered as a proof either of the presence or the amount of inflammation or even of irritation of the pleura, for it is often greatest immediately upon the perforation and passage of air into the pleura, and before inflammation is developed by the occurrence. Besides, it is often occasioned by the stretching of adhesions which had existed, and is thus, as well as in other circumstances, independent of inflammatory action. Still we should be prepared for the supervention of inflammatory irritation of the pleura soon after the air has acted upon this surface, especially if the atmosphere at the time be cold and dry; and this complication of inflammation with the pneumathorax will be more certainly indicated by the states of the pulse, skin, and tongue, than by the amount of pain. If the pulse become hard or constricted, the skin dry, and warmer over the affected side, or if the parietes of the side are tender or sore upon pressure or percussion, and if the patient be young, robust, or plethoric, or of the sanguine temperament, then bloodletting, general or local, the latter most frequently, but the former in some instances, and both in others, especially in the circumstances just stated; antimonials, mercurials, and opiates; cooling diaphoretics, aperients, and external derivatives and counter-irritants, as advised for *inflammations of the pleura*, are the means chiefly to be relied on. But these means should be directed with due attention to the peculiarities of individual cases, as insisted upon in the preceding article.

20. Instantly upon the occurrence of this lesion—within even a few minutes of it, as I have seen in one instance—but at any indefinite period afterwards, the quantity of air drawn into the pleural cavity may be so great, and the distension of the parietes of the side so very considerable, as to suggest reasonable fears of almost immediate suffocation, not only from complete compression of the lung of the affected side, but also from a less compression of that of the other side. In these circumstances, exit should be given to the air by puncturing the parietes of the thorax. I am aware that the propriety of resorting to this mode of relief has been questioned; but an instantly impending fatal result has to be averted; and in some instances it may be averted for a considerable time, almost always for a short time, and possibly for months, or even years, by resorting to this operation. I believe that recourse to this operation should not be delayed when pneumathorax has occurred at an early period of phthisis, or when the patient is young, not greatly reduced, or whilst he has not advanced very nearly to a probable termination of a disease which would certainly end fatally, even if perforation of the pleura had not taken place. The pain and risk of the operation is nothing in comparison with the continued distress experienced during the pneumathorax; and although relief may be only temporary; the operation may be repeated several times without increasing the risk of life, but on the contrary greatly diminishing it.*

21. It is unnecessary to remark further respecting the treatment of pneumathorax, inasmuch as the means which have been recommended for chronic pleurisy and empyema are generally applicable also for the more complicated malady which has just now been considered; due regard being had to the peculiar features of individual cases. (See Art. PLEURA, §§ 175. *et seq.*)

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* In 1833, a case of pneumathorax occurred in my practice, at an early stage of phthisis; the patient being young and robust, and not having lost flesh or strength. The nature of the mischief was prominently characterised: the heart was pushed remarkably far to the right side; and the rational and physical signs were all marked and extreme; the dyspnœa and distress were great. I advised that an opening should be made for the exit of the air; and the friends of the patient desired that Sir A. COOPER should make it. We met a few hours afterwards; he admitted his ignorance of the nature of the lesion. I fully explained the cause of the symptoms, and of their extreme urgency; but he refused to perform the operation, stated that he had never performed it with the view of letting out air, and that he would not now do any thing so novel, although he would have been ready to undertake it when he was a much younger man. Having heard Sir ASTLEY's determination, the patient's friends would not allow the operation to be resorted to by any one else; and the patient died asphyxied a few hours afterwards. The operation, if it had been resorted to in this case, might have prolonged life for a very considerable period.

POISONS—Poisoning—Poisoned—Symptoms and Treatment of.

Classif. — General and Special Pathology and Therapeutics.

Poisons may be defined to be *substances which act injuriously upon the human body.* The number of substances which may be comprised under this definition, even in the present state of our knowledge of the productions of the three kingdoms of nature, is very great; and many of these, owing either to their weak powers, or to the imperfect state of our knowledge of their effects, will receive only a slight notice, or be entirely overlooked. It should, however, be recollected that there are many substances which act injuriously when improperly employed either as articles of food or as medicinal agents; this improper employment having reference rather to the quantity used, and the conditions of the frame in which it is employed, than to the injurious nature of the substance. The *definition* therefore may be extended as follows: — *Substances which exert a deleterious influence on the human frame, when taken internally or applied externally, as regards either their nature or the quantity of them employed; or which tend, in either respect, to destroy life, when thus used.*

1. Whilst the word *poison* refers to the substance exerting the deleterious influence, *poisoning* is the commission of the injurious act, and *poisoned* is the state or effect resulting from the substance or agent employed. These words may thus be viewed as referring respectively to the *agent*, the *act*, and *actor*, and the *effects* or pathological states produced by the poisonous agent. It is obvious, that the investigation of the *first* and *second* of these, with due precision, belongs to *legal medicine* or *medical jurisprudence*, and that it consequently does not fall within the scope of my work. I have only briefly to consider the *symptoms* and *effects of poisons* — the *pathological states* produced by substances, whose injurious effects have been observed and recorded by medical authorities, and the best *means of preventing, counteracting, or removing these states.* Before, however, I venture to discuss the pathological effects of individual poisons, and the treatment of these effects, I shall briefly consider — 1st. *The modes in which poisons are employed or exhibited.*—2d. *The action of poisons.* —3d. *The channels through which poisons act in producing their effects.*—4th. *The general effects of poisons;* — and 5th. *The special operation of poisons.**

2. I. The Modes in which Poisoning takes place, whether the act is felonious, intentional, or accidental — whether it is suicidal or from intentional exposure to the agent — are more diverse than may appear on a hasty view of the matter; and the effects produced and the treatment required are thus equally diversified: — 1st. *Several gases, vapours, or fumes of volatile or vaporisable substances have been intentionally exhibited, or accidentally inhaled, so as either to arrest the respiratory actions, or to impede or obstruct, or otherwise influence the changes produced in the blood by respiration, as well as those changes of function, and sometimes even also of organisation, which take place either primarily or consecutively in the nervous centres.* Several vapours or fumes, medicinal as well as poisonous, may be inhaled into the lungs with the view of producing certain anticipated effects. Some of these are thus employed more or less beneficially. Others are more obviously injurious, or even fatal; and a few have recently been directed to purposes which are considered beneficial, after the very superficial and empirical view which has hitherto been bestowed upon this mode of employing them. The vapours of several substances possess the power not only of impeding the changes produced in the blood by the air during respiration, but also of altering the physical characters of the blood itself and the state of the nervous functions. These alterations of the blood and nervous systems are produced not only immediately upon the blood circulating in the capillaries of the air-cells, and upon the organic nerves supplying the respiratory organs, but also consecutively, owing to the passage of the vapour to some amount into the circulation, and to the actual admixture of it in the blood, and to its action

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* The following *Synopsis* will show the extent of consideration which a due discussion of the subject now before me ought to comprise. My limits as well as the scope of the work will admit only of a hasty view of the several topics here enumerated: —

I. Modes in which Poisons are employed or exhibited.
- i. *To the Respiratory organs* — Inhaled or Inspired.
- ii. *Taken into the stomach.*
- iii. *Applied externally* — (a) The cuticle not having been removed.
  - (b) To a surface the cuticle of which has been removed.
  - (c) Introduced by, or into, a wound.
  - (d) Injected into blood-vessels.
- iv. *Injected into the large bowels.*
- v. *Introduced or injected into the sexual organs.*
- vi. *Injected into the urinary organs.*

II. The action of Poisons.
- i. *Poisons act locally and primarily.*
- ii. *Remotely and consecutively.*
- iii. *Both locally and remotely.*
- iv. *Chemically.*

III. Channels through which Poisons act.
- i. *Primarily and locally.*
  - a. On the nerves of the part.
  - b. On the capillaries and vessels of the part, and the contained fluids.
  - c. On the irritability of the tissues.
  - d. On the general structure of the part.
- ii. *Sympathetically, or by nervous influence* — or through the media of the organic and animal systems of nerves.
- iii. *Organically, or by imbibition or endosmose, and absorption* — or through the medium of the circulating fluids.

IV. General effects of Poisons.
- i. *Depressing nervous influence and vascular action* — Lowering vital power.
- ii. *Inordinately exciting nervous influence, either organic or animal.*
- iii. *Inordinately exciting vascular action.*
- iv. *Exciting nervous influence and vascular action* — Exciting vital power.
- v. *Exhausting nervous influence* — or exhausting vital energy.
- vi. *Altering nervous influence and vital power.*
- vii. *Producing a succession of two or more of these states or effects.*

V. Special operation of Poisons.
- i. *Abstracting the animal caloric or depressing the calorific process in a part, or throughout the body.*
- ii. *Benumbing, depressing, or suppressing sensibility, or the organic nervous influence.*
- iii. *Paralysing involuntary motion and voluntary movements.*
- iv. *Softening, liquefying, or dissolving one or more tissues or textures.*
- v. *Irritating particular organs or parts.*
- vi. *Astringing and increasing the tone or vital cohesion of certain tissues.*
- vii. *Diminishing or increasing the irritability of contractile parts.*
- viii. *Augmenting certain secretions and excretions.*
- ix. *Stimulating the ganglial, spinal, or sensory nerves.*
- x. *Altering the vital actions — the secretions and nutrition of particular organs or textures, according to the substance employed, and the mode of employment.*

on this fluid and on the nervous centres. The vapours of alcohol, of all strong spirituous liquors, of most ætherial fluids, of spirits of turpentine and several volatile oils, produce a more rapid effect when inhaled in more or less concentrated states than when these substances are taken into the stomach; and if the vapour inhaled be much concentrated, or if the inhalation be continued for some time, the changes produced in the blood, and the effects on the nervous system, are such as to endanger or to destroy life. This more immediate and intense effect arises chiefly from the extent of surface upon which the vapour acts, and from the rapid imbibition of fumes or vapours by the respiratory mucous surface. But this subject will be more fully shown in the sequel, when the special operation of certain injurious agents is considered. Most of its pathological and therapeutical relations are discussed in the Article Asphyxia.

3. 2d. The most frequent way in which poisons are exhibited is *that by the mouth—the injurious substance being taken into the stomach* either alone, or simply diluted, or in the drink or food. It is obvious, that the symptoms and the effects of any poison are much modified by the state of dilution or of admixture with alimentary articles when thus exhibited, and by the condition of the stomach at the time, especially as regards the nature and amount of the contents of this viscus. The state of the constitution, and of the health, and other circumstances connected with the person poisoned, as well as with the agent employed, also materially influence the effects produced in different cases, by any individual poison, although the quantity exhibited is the same. The rejection by vomiting of a portion of the poison, the time that has elapsed from the moment of exhibition, the amount and character of the evacuations it may have produced, and the precise nature and character of the effects observed at the period when the patient has been first seen by the physician, require, both individually and in connection, to be duly considered by him, the inferences which he must promptly draw from these being made the basis of the most prompt measures of aid. The digestive mucous surface being protected by a mucous secretion, and by the secretions furnished by the collatitious viscera, and frequently containing more or less partially digested matters in addition to the vehicle of the poisonous substance, an injurious effect is produced upon it much less readily in many instances, owing to these circumstances, as well as to the nature of the poison employed, than upon some other parts where the poison is more rapidly absorbed and carried into the circulation. Besides, the injurious substance is often in great part thrown off the stomach, or passed through the bowels; and that which remains, by irritating and inflaming the villous surface, is thereby prevented from being absorbed, or so entirely absorbed as it might otherwise be, into the circulating fluids; absorption, imbibition, and endosmosis not so readily taking place in these circumstances as in others. Nevertheless, the injurious impression made by the substance taken into the stomach upon the nervous systems, and especially upon the organic or ganglial, may continue or may increase, and be extended to several of the collatitious viscera, and even to remote organs, as the brain, spinal chord, heart, lungs, and kidneys,—to the former by nervous communication, and to the latter partly by this channel, and partly through that of the blood and vascular system, either mode of operation predominating in different cases, according to the poison which has been taken. I need not, however, dilate further on this topic, as it will receive numerous illustrations in the sequel.

4. 3d. *When poisons are applied to the external surface of the body*, the effects are contingent upon the state of the cuticle, which forms an efficient protection against injurious substances, excepting such as are most irritating or virulent; and even many of these latter are inoperative unless they are allowed to remain applied to the surface for a considerable time. — (*a.*) The *protective power of the cuticle* varies in different temperaments and constitutions; substances which produce little or no effect when applied to the cutaneous surface of one person rapidly affecting others when thus employed. This difference most probably depends upon the varying grades of density, thickness, &c., of the cuticle, and possibly also upon the vascularity and sensibility of the subjacent tissues.

5. (*b.*) Poisonous substances, applied to the skin *after the cuticle is removed*, or even to a mucous surface, but more particularly to this surface when its epithelium is detached, produce their effects with great rapidity — the period varying however with the situation, the duration of contact, and the nature and state of the substance. The effects depend upon the nature and intensity of the impression made upon the tissue, upon the sensibility and vascularity of the part, upon the rapidity and amount of imbibition and absorption, and upon several other circumstances which will be more fully set forth hereafter.

6. (*c.*) *When a poison is inserted in a wound*, the effects will be nearly co-ordinate with those which result from its application to a surface deprived of its cuticle or epithelium, some variation probably resulting from the nature and situation of the wound, and upon the degree in which the injury may favour the retention, and the situation facilitate the absorption of the poison.

7. (*d.*) The *passage of the poison into a vein*, or the *injection of it into a vessel*, is productive of the most rapid effects, relatively to the operation of the particular agent employed; for not only is a local effect thereby produced, but the poison, being directly carried into the circulation, operates, according to its nature, both upon the blood and vascular system, and upon the nervous centres, and the vital and excreting organs.

7*. (*e.*) When a poisonous substance is employed externally in either of the modes now indicated, the effects depend principally upon its nature. Numerous specific or other animal poisons, and several virulent vegetable poisons, are thus inoculated; and diffusive or septic inflammation and destruction of the cellular tissue, erysipelas, the contagious exanthemata and fevers, inflammations of the lymphatics, veins, arteries, and glands, various specific diseases, as rabies, smallpox, &c., and other virulent maladies, in which the organic nervous energy is depressed or annihilated, and the circulating fluids are contaminated, are thereby produced. The inoculation of most of these poisons is accidental, but it may be intentional—felonious or suicidal. Certain of these poisons, when allowed to remain in contact

with the surface, may produce their usual effects, although the cuticle or epithelium is entire: but when they are brought in contact with an abraded surface, or introduced into a punctured or incised wound, the effects are rapid, and vary in character with the nature of the poison, and the affection of the constituent tissues of the part injured; some occasioning a septic contamination — a solution and disorganization of the cellular tissue, which rapidly spreads, and poisons the circulating fluids; others affecting the veins, and producing asthenic and spreading inflammation of them, with all its worst consequences; several inflaming the absorbents and absorbent glands; and certain others implicating two or more of these, and often the nerves, arteries, and other structures in addition; the secondary and more remote effects being still more complicated, and the ultimate results being often speedily fatal. Numerous illustrations of what I have now advanced will appear in the sequel, when certain animal poisons come under consideration, and may be adduced from the history of infectious and contagious maladies.

8. 4th. *Poisons may be injected into the large bowels*, either accidentally or intentionally, and produce in this situation their peculiar and even fatal effects. Even certain of them may be thus employed medicinally, and, owing either to the ignorance of the prescriber of their influence in this situation, especially in some diseases and states of vital power and action, or to idiosyncrasy of constitution, their operation may be most dangerous or even fatal. Some injurious substances, when taken into the stomach, and mixed with the aliments, are somewhat changed by the action of the secretions, whilst the primary impression produced by them is thereby impaired or modified, and the absorption of them is delayed or prevented, if, indeed, they be not instantly thrown off by vomiting; but there are many which, when thrown up into the large bowels, act more rapidly and more virulently than if they had been taken into the stomach, owing to rapid absorption often taking place in the large bowels, and to the circumstance of their being less likely to be changed in this situation.

9. 5th. *Poisons have been introduced into the sexual organs*, especially of the female, where they have produced their local as well as constitutional effects, the former of these effects being severe according to the nature and quantity of the substance thus employed; and the latter depending upon the same circumstances. This mode of poisoning, as well as the next,

10. 6th. *The injection of poisons into the urinary passages*, is of rare occurrence: it has, however, been employed both feloniously and accidentally; whilst the treatment of several maladies of the sexual and urinary organs, by means of injections of various stimulating, astringent, tonic, or acrid substances, has caused, either directly or indirectly, most injurious, or even fatal results, especially when these have been resorted to in cases to which they were inappropriate.

11. II. OF THE ACTION OF POISONS. — *Poisons*, according to the definition of the word given above, may act, 1st. *Locally and primarily*, — 2d. *Remotely and consecutively*, and 3d. *Both locally and remotely*. Thus the substance applied either to the external surface, or inhaled into the lungs, or taken into the stomach, may only corrode or inflame the part with which it comes in contact, this effect being so intense as to endanger or even to destroy life. It may produce but little or no lesion or visible change in the part to which it is applied, and yet, through the medium either of the nervous systems or of the circulating fluids and vascular system, it may destroy the individual. And lastly it may, after having occasioned more or less remarkable local changes, affect the nervous systems, or the vascular system and fluids, or both the nervous systems and the vascular system, with the fluids, secretions, and excretions, thereby destroying life, and sometimes altering even the structure of several of the organs of the body before life is extinguished. Sufficient illustration of these modes of action will appear in the sequel; but I must consider them individually and more particularly, and with reference to the tissues which poisons seem especially to affect, and the channels and media through which they act.

12. i. OF THE LOCAL AND PRIMARY ACTION OF POISONS. Whether or no the injurious action of a substance be limited to the part to which it is applied, or be extended much further and to distant parts of the frame, it is of moment that we should have some acquaintance, the more intimate and accurate the better, with the nature of the effect produced locally, and with the changes in the constituent tissues of the part. — (*a.*) Certain substances, as aconitine, prussic acid, &c., even when applied to an external part, protected by its cuticle, will occasion numbness or want of sensibility, without any other visible change; the local effect thus produced in the *nerves* not proceeding further, unless the application be protracted or repeated, or the activity of the poison be great, or the cuticle be removed. This effect upon the sensibility evinces not merely a special operation of the substance, but also a disposition or power possessed by it to affect more generally and sympathetically the whole nervous systems, although certain parts of this system may betray the effect in a more remarkable degree.

13. (*b.*) Other substances produce a more severe local effect, and yet this effect will continue altogether, or more or less, limited to the part; the injurious operation being caused rather by the intensity and extent of the irritation locally excited than by any other more extended impression or change produced by it. Substances occasioning a local injury or irritation, as mechanical irritants, fragments of broken glass, &c., excite the organic and animal sensibility in the part with which they are brought into contact; and soon afterwards the vessels, the capillaries especially, and contractile parts, are implicated; and even further local changes of structure ensue, owing to the effusion of lymph, serum, &c., and to the alterations thereby produced.

14. (*c.*) Certain substances, whilst they benumb the sensibility of the part to which they are applied, also impair the irritability of the fibrous or contractile tissues; and others, whilst they excite the sensibility, also increase, for a time, both the susceptibility and the power of contractile or irritable parts, ultimately exhausting these properties, according to the nature and quantity of the substance employed, and thereby showing the intimate connection existing between sensibility and irritability, and demonstrating that substances which either benumb, or excite, or exhaust the one, similarly affect the other. The more active of these

agents may thus destroy life by their local effects, especially when they act upon vital organs or parts. Even mechanical agents or irritants, by their intense action locally, and the nature or functions of the organ, surface, or tissue with which they come in contact, may destroy life by their local effects entirely or chiefly. The changes produced by numerous substances are of such a kind as admit of their usual procession being observed. First the nerves of the part, and the sensibility, are either benumbed, or excited, or irritated, or exhausted, and the contractile property of fibrous tissues similarly affected. Then the capillaries and the contained fluids are implicated, and all the phenomena, either of congestion or of inflammation, with the usual results, are developed, according to the nature of the agent employed.

15. (*d.*) Other substances act so rapidly, and produce so general an effect upon the constituent tissues of the part, involving them all in the effect produced, or inducing disorganization, with so great rapidity as to render it difficult, if not impossible, to determine the particular element or tissue primarily or principally affected, or to trace the procession of changes. Intense heat and cold, numerous chemical agents, and some septic poisons derived from the animal and vegetable kingdoms, produce this more intense and disorganizing effect upon the part to which they are applied. Some congeal, constringe, desiccate, corrugate, carbonise, or otherwise destroy the structure; and others dissolve, liquefy, or annihilate the vital and physical cohesion of the several textures, which fall into a state of dissolution or pulpy destruction with varying degrees of rapidity.

16. ii. OF THE REMOTE OR CONSECUTIVE ACTION OF POISONS.—The primary impression, or action of poisons is seldom such as destroy life of itself, or without producing remote or consecutive effects. If, owing either to the intensity of the local action, or to the extensive disorganization produced in the part, death should quickly follow the application of an injurious or poisonous substance, the effect may be imputed chiefly to the shock received by the vital power, unless the agent acts directly upon a vital organ, whose circulation and functions it is capable of immediately arresting. A corrosive substance, as nitric or sulphuric acid, &c., taken into the stomach, owing either to its nature or the quantity employed, or to both, causes death in a very short time; but this result is not owing merely to the local action, but to the shock produced by a severe injury inflicted upon an organ supplied by nerves from the organic or ganglial nervous system, and intimately associated in function and organic nervous energy with the organs most necessary to the continuance of life. The local injury is inflicted, the whole body instantly experiences or feels it; the shock, or injurious impression, is rapidly transmitted throughout the whole organic nervous system; and, if it be intense, it annihilates not only the vital influence of the organ on which it primarily acts, but also, and through the medium of the organic nervous system, the action of the heart, of the diaphragm, of the lungs, of the brain, &c. Thus the more immediate of the remote effects are produced, sometimes with a rapidity which might lead to the inference that the local impression and the consecutive result are but one operation. More frequently, however, this result takes place with much less rapidity; the primary injurious impression inducing a succession of pathological phenomena, which often admit of due recognition, as they are manifested in either the nervous or the vascular system, or the blood, or the secretions, or the excretions, or in several or even in all these, as will appear in the sequel.

17. It is obvious that, whilst some injurious agents, from their nature or the quantity, may act either locally or remotely, primarily or consecutively, or in either of these chiefly, there are others which act *in both modes*, either one predominating over the other, according to the agent or agents employed. The mineral acids, in large quantity, or in a concentrated state, act locally, destroy the textures, occasion a general shock of the frame, and even terminate life. In small quantity, or less concentrated, the local action is much less intense, and remote effects are developed, and are such as admit of being traced. Various vegetable or narcotic poisons produce but slight or no apparent local change, yet affect organs remote from the seat of application in a very remarkable manner; and many substances change not only the tissues, on which they primarily act, but also the states of distant parts; these substances even deriving their chief appellations, as acro-narcotics, &c., from their compound properties.

18. III. THE MEDIA OF CHANNELS BY WHICH POISONS ACT.—It is of great importance to trace the channels through which substances act injuriously on the frame; for the knowledge of these enables us on many occasions to prevent or to arrest the effects produced by these substances. But in order that the media or channels of remote or consecutive effects should be recognised, it is necessary in the first place to ascertain the local and primary operation of the substance, the more remote effects of which we are desirous of tracing in the successive changes produced by it. It becomes therefore desirable to consider — 1st. *The nature of the local and primary impression produced by a poison.*—2d. *The extent and amount of the sympathetic effect, or of the operation by nervous communication or influence as far as this may be known;* and 3d. *The organic operation of a poison, or the circumstance of the imbibition and absorption of the substance in furious employed*, and the probable extent or amount of the mischief produced which may be imputed to this mode of operation. As poisons thus act *locally, sympathetically*, and *organically*, or in the ways now specified, and as it is obvious that the action of a particular poison is not limited to any one of these modes, although it may operate in either way more prominently than in the others, it may not be superfluous to consider the matter more in detail.

19. i. *The nature of the local and primary impression produced by a poison* is not always readily ascertained; for, owing either to the quantity or the intensity of action of the substance employed, the several constituent systems and tissues of a part may be so instantly and generally impressed and altered by that substance as not to furnish distinct evidence of the tissue primarily affected, as I have above contended; but in other circumstances the local changes, as well as the consecutive effects, often admit of analysis, although sometimes imperfect, the results necessarily varying with the circumstances of particular cases.

20. *A.* The *nerves* of the part, whether the

organic, the sensory, or the motory, are evidently primarily affected according to the texture to which the poison is applied, or are the first to manifest the effect, unless the substance be such as rapidly to change the organization of the structure; and according as either of these orders of nerves is implicated or impressed, so will the secretions, the sensibility, or the movements of the part be affected.

21. *B.* The *irritability* of contractile tissues is also altered by poisons, more especially by those which change the state or functions of the organic nervous system. If what I have contended for, in the article Irritability, namely, the dependence of this very prominent vital property upon the organic nervous influence, be admitted, it necessarily follows that this property will be co-ordinately affected by whatever changes the state of this influence; and a close investigation of the operation of many poisons proves that those substances, as certain animal poisons, which inordinately depress, or altogether annihilate this influence, affect the irritability of the contractile tissues in a similar manner, and in a co-ordinate degree.

22. *C.* The *capillaries and vessels* of the part must also be changed, as regards their vital properties, whenever the organic nervous influence and irritability are affected; and the change of these vessels must be necessarily similar as to kind and degree with that primarily produced in the organic nerves and contractile tissues. There is every reason also to believe, that the change is not limited to the capillaries and smaller vessels, but extends more or less manifestly to the contents of these vessels, more especially to the red globules and to the fibrine of the blood which they contain; the condition of the former constituent of the blood in these vessels, and the quantity or state of the latter, being always very materially altered by the morbid impression made upon the organic nervous influence and irritability of the part, and upon the vital properties of the capillaries; the physical and chemical characters of the blood in these vessels being thereby thus rapidly changed.

23. *D.* The alterations thus produced in the organic nervous influence, in the irritability, in the state of the capillaries, and in the contents of these capillaries — in the blood — of a part to which a poison has been applied, must necessarily soon be followed by further changes in the whole of the tissues constituting the part — in its *whole structure* — and these changes will be rapid, extensive, and diversified in character, according to the nature of the poison, and as it acts prominently upon either the nerves, or the capillaries, or the fluids, or the other constituents of the part; or in any of the particular modes which will come under consideration in the sequel.

24. ii. *The sympathic operation of poisons*, or the action of a poison on parts remote from that to which it is applied by means of the nervous system, or by any of the orders of this system—the organic, the sensory, and the motory—evidently obtains to a very considerable extent, especially as respects the action of some poisonous substances; but, as this medium of operation is not the only one, and as it is frequently associated with that about to be considered, namely, the blood and vascular system, either channel being more or less operative in producing the remote effect, according to the nature of the substance and state of the system, it is often difficult to determine the precise extent to which either contributes to the ultimate result. It will, however, be shown in the sequel, that certain substances when taken into the stomach, or injected into the bowels, or otherwise brought into contact with parts supplied chiefly with the organic or ganglial nerves, have not merely the sensibility of these nerves excited, but also the involuntary movements of parts distant from that to which the substance was applied remarkably affected, owing to the local irritation being transmitted through the medium of this order of nerves, and the connection of these nerves with nerves of sensation, and with the roots of the spinal nerves; and, further, owing to this connection, the effects are often extended to the spinal chord and to the brain, and thence reflected upon voluntary muscles and the extremities of the body, the resulting phenomena varying with the nature of the injurious agent and the temperament and constitution of the person poisoned by it. It is unnecessary to illustrate this topic at this place, as it is fully discussed in the articles Irritation and Irritability, and especially in that on Sympathy or associated morbid states.

25. iii. *The organic operation of poisons*, or the imbibition and absorption of them, or the action of them through the media of the circulating fluids, as the lymph, the chyle, and the blood, is one of the most important ways in which the effects of these substances are produced. Still this way is not always the same, the route varying with the organ or part to which the poison is applied, and with the nature and action of the particular poison employed. The imbibition or endosmose of some substances through membranous tissues is often much more rapid than that of others; but much depends upon the physical state of the poison, and concentration of the solution of it employed, and other circumstances. The passage of some substances into the blood, when either applied to a mucous surface, or to a surface denuded of its cuticle, or epithelium, or introduced into a wound, is often much more rapid than might be supposed, if the fact had not been demonstrated by experiments. Nevertheless, the rapidity of the introduction of certain poisons into the circulation has been, according to a few observations I have made, overrated by some writers, who have considered that the passage of a poison into the blood may take place in a very few seconds. It will certainly occur in much less than a minute in some cases; but I doubt the extreme rapidity contended for by some physiologists. Great rapidity of absorption is observed chiefly as respects certain saline or virulent vegetable and animal poisons, which are readily imbibed by the capillaries and carried into the blood. Substances which are absorbed by lacteal or lymphatic absorbents act much more slowly, and several of them require a considerable period before they reach the blood, especially if the vessels which have absorbed them pass through glands; and when this is the case the glands are often affected, and in some instances, when the poison is not very virulent or rapid in its operation, the glands either altogether arrest, or delay, for a longer or shorter time, the progress of the mischief.

26. The poison having been carried into the circulation either by the lacteal absorbents, or by

the lymphatics, or by the capillaries and veins, according to the seat or part to which it is applied, and the action which it exerts on the constituent tissues, produces ulterior effects, which are about to be briefly considered, owing to its action, —1st, on the blood itself, in which it mixes, and which it contaminates;—2d, on the blood-vessels and heart;—3d, on the nervous ganglia and plexuses;—4th, on the spinal chord and the sensory and motory nerves;—and 5th, on the brain and organs of sense.

27. iv. Those poisons which act more or less *chemically* are most readily imbibed, are absorbed most directly and rapidly, and change not only the physical characters, but also the chemical constitution of the blood, as far as we are acquainted with that constitution. They change the colour, and there is reason to suppose that they affect also the organization of the red globules; they alter or diminish the fibrine, and variously affect the saline and albuminous constituents of the blood. But there are few of those substances which act thus chemically upon the blood, especially alkalies, acids, and numerous neutral salts, that do not also affect the vital condition of this fluid, and change this condition and its chemical constitution both in relation to each other, and in connection with the vessels and heart, and with the nervous centres, more particularly the nervous system actuating the circulating apparatus.

28. IV. General Effects of Poisons.—i. *Some substances or agents depress nervous influence and vascular action*, and thereby lower vital power; the depression being either relative or absolute, and varied in its effects, according to the agent and the quantity, intensity, or duration of its operation. The application, for instance, of cold, or, more correctly, the abstraction of vital caloric, when moderate or of short duration, or acting upon a surface or part only of the body, depresses vital action in that part during its continuance; but re-action takes place when the depression is limited as to seat and time, owing to the determination of the circulation to more internal or to vital parts, or when muscular action accelerates the flow of blood in the vessels. But when cold, owing to its intensity or continuance relatively to the state of the system whilst exposed to it, renders torpid the organic nervous influence, and retards or interrupts capillary and venous circulation through a considerable extent of the frame, re-action may not take place, or may occur so imperfectly or irregularly as not to relieve internal congested organs; and if it occur it may be attended with, or develope inflammation in some predisposed organ.

29. There is perhaps no other agent which tends so completely to depress both the nervous and vascular functions so as even to overwhelm them altogether as cold, when it acts either intensely or for a long period relatively to the constitution and circumstances of those subjected to its influence, or when it exceeds in grade that which has just been stated to admit only of imperfect re-action. Like other agents, therefore, cold is either a tonic, a sedative, or destructive of life, according to its grade and the manner of its operation on the living œconomy; but there is scarcely another physical agent whose sedative effects are so equally manifested upon all the general systems and functions of the frame, and without directly producing some other operation, unless the respiration of air, loaded with carbonic acid, or with sulphuretted hydrogen, or prussic acid used in any form be exceptions. Aconite and colchicum are sedatives to the sensory and organic nerves especially, but they also irritate the surfaces to which they are applied; and digitalis and tobacco act chiefly on the heart and vascular system, without materially depressing the nervous functions of animal life, or the functions of the brain and spinal chord. When, however, these, or other substances, which produce a general sedative or depressing effect, as respects nervous influence and vascular action, are exhibited in large or injurious quantities, their subordinate operations are then so masked as to escape notice, or are so inconsiderable as not to deserve attention. Certain poisons which produce a narcotic effect upon the nervous system, when given in moderate doses, exert a sedative influence upon the vital actions generally, when taken in still larger or poisonous quantities, as shown by opium, belladonna, conium, hyoscyamus, &c., when so exhibited.

30. The sedative effect, when it becomes injurious, is generally not limited either to the part to which the agent is applied, or to a particular system or organ. Besides depressing nervous power in the surface or viscus to which a sedative poison is applied, and causing capillary and venous congestion, the morbid impression is propagated along the nerves to more distant parts, especially to the nervous centres, whilst the poison itself is partially absorbed, and, mixing with the blood, it acts directly upon the nervous masses, and more or less also on various organs, according to its specific influence. This being the general effect — the result being depressing, and ultimately destructive of organic nervous power and vascular action, with varying degrees of rapidity, according to the nature of the poison and the quantity employed,— it may be imputed, according also to the nature and quantity of the agent, to either of these channels or media principally, or to all of them, although in different grades, the fatal or injurious operation arising through these sources singly, or conjointly, but in varying proportions.

31. ii. *Some poisons inordinately excite nervous influence and vascular action*, or stimulate vital power for a time. Heat and oxygen are the most influential agents in producing this effect, and they perpetuate it perhaps longer than any other without exhausting vital action, especially upon withdrawing them. Alcohol, the æthers, ammonia, and numerous other stimulants, may become poisons when exhibited in large quantities, or when long employed, owing partly to their effects locally, but especially to their influence, through the media of the nervous and vascular systems, and of the blood upon the nervous masses or centres, and upon the liver and excreting organs. It is seldom, however, that stimulants destroy life before they have induced either exhaustion co-ordinate with the stimulating action, or effusion to an amount sufficient to interrupt the functions of a vital organ, or alterations of the circulating fluids incompatible with the continuance of the nervous functions or of the heart's action, or even inflammatory or structural changes of some important viscus, or some two or more of these changes.

32. iii. *Exhaustion of organic nervous power, and of sensory and motory influence*, or of vital

energy generally, is one of the most manifest general effects of substances given in quantities sufficient to destroy life in a short time. This exhaustion is especially remarkable when it is caused by substances which injuriously impress the nervous systems, or which act so rapidly as to render it difficult to determine whether the impression of the agent be transmitted by means of the nerves to the heart and brain, or whether the substance is itself absorbed into the circulation, where it directly acts upon these organs, or whether it acts in both ways. Poisons which may be said to kill by exhausting the vital actions must necessarily be considered as having first produced an excessive stimulating effect, which has so rapidly passed into exhaustion as to leave the primary operation unobserved or even unobservable, for exhaustion implies antecedent stimulation. Nevertheless, if the operation of many of the substances which are generally said to destroy life by exhausting vital power, when given in large quantities, be considered with reference to their effects upon the living œconomy in small doses, it will be found either that the quantity which is stimulating is very small, or that the stimulating operation of the substance, even in such quantity, is very equivocal; and, if it may be admitted to exist, it rapidly lapses into a distressing or peculiar form of exhaustion, as may be allowed in respect of tobacco and various narcotics. From this it will appear, that the poisonous effect of the same substance may be imputed by one person to the powerful sedative effect it had produced in the quantity or dose in which it had been given, and by another to the extreme exhaustion consequent upon a great and rapidly evanescent stimulation, &c., according to the views each may entertain of the physiological action of the substance in question.

33. iv. *The general effects of poisons cannot be viewed as merely dynamic: they also alter or change the states of nervous influence and of vascular action.* Those substances which prove rapidly poisonous, owing to their nature or the quantity taken, evince the dynamic operation more remarkably. This may, however, be owing to the circumstance that the dynamic action is much more recognisable than any change in character or kind of action, during the short period intervening between the impression of the agent and a fatal result. It is chiefly such poisons as act slowly, or some of those which are more virulent, but which, when taken in small quantities, are not rapidly fatal, that produce more or less manifest alterative effects. Still these effects are not solitary; they are generally associated with one or two of the general effects already noticed, and also with certain others, which are more specific, or which appertain to the poison in question, and in some respects characterise its operation when employed either medicinally or otherwise. The alterative effects of poisons being recognised with difficulty, in connection with other more general and remarkable results, unless the operation is slow, and as these effects are more peculiar or specific, and at the same time more complicated, I shall proceed to consider them more in detail, and endeavour to analyse them, or show their more special influences, although I cannot do so at this place in so full and satisfactory a manner as I am desirous of doing.

34. V. The special Operation of Poisons.—It is obvious to the experienced observer of the operation of the more active agents of nature upon the living œconomy, that very few act in one unvarying manner, or that any one of them produces a single effect, or acts solely upon a single function or part, without also affecting others more or less. All that such an observer of the more special actions, either of medicines or of poisons,—and most of the former possess the latter property,—can expect is this, that, although any one of these substances produces certain general results, and extends its influence more or less to different functions and even to remote organs, some particular surface, function, or viscus—some one of the chief factors of life, or of the constant actions and results which these factors produce—some of the manifestations of life in particular tissues, systems, organs, or parts, will be more prominently affected than others, or be chiefly, but not solely, changed by the action of that substance. In the analytical survey I am about briefly to take, it must, therefore, be considered that the special action of any single poison is not confined to the production of one only of the several effects which I shall have to notice under the separate heads which the analysis furnishes; but that it extends to more than one system or viscus, although some one manifests it much more than another, and alters certain vital properties and functions, or a particular property or function, more than others. When the symptoms and changes produced by individual poisons, and the modes of obviating and removing these changes, come under consideration, then the associated and even complicated nature of these changes will be made more evident.

35. i. *Some injurious agents abstract the caloric, or depress the vital calorific process not only in the part to which they are applied, but also throughout the body.* This effect may be produced by the application of cooling substances, or by whatever lowers the organic nervous influence and vascular action, or by both modes of action produced either simultaneously or in rapid succession. A large quantity of cold water or of ice taken into the empty stomach, especially when the system is exhausted by fatigue, or when the body is perspiring freely, may not only abstract the animal heat from parts requiring a certain elevation of temperature for the performance of their functions, but also depress the organic nervous influence actuating these parts, so as to produce capillary and venous congestion, or an arrest of the circulation, and other consecutive effects, until the action of the heart ultimately ceases. Although cold fluids may destroy life very rapidly when taken largely in these circumstances, in the manner now stated, and owing to the influence of cold upon vital actions, as noticed above (§§ 28, 29.), yet there are hardly any substances which are poisonous owing chiefly to this mode of action, although there are several which, when employed in large or frequent doses, produce a refrigerating and depressing effect along with other changes of a more prominently injurious nature, more especially the hydrochlorate of ammonia, the nitrate of potash, and various other salts and dilute acids, which not only depress the calorific process, but also chemically and physically affect the blood and vascular system, and through this medium the nervous system also.

36. ii. *Certain poisons act more especially in*

destroying the sensibility, or the functions of the sensory and of the organic nerves, in benumbing, depressing, or suppressing sensibility, and the organic nervous influence. Of these the most remarkable are monkshood and its active principle aconite, cold; æther and alcohol when absorbed or injected into the blood, or when their vapour is inspired; belladonna, conium, morphia, and most of those which have been denominated narcotics, sedatives, and stupefacients. But these produce also a paralysing effect, remarkably depress the organic nervous influence, diminish irritability, impede secretion and excretion, or even irritate the mucous surface to which they may be applied, as colchicum, tobacco, hyoscyamus, opium, &c.

37. iii. *Other poisons more prominently paralyse the organs of voluntary motion, whilst they impair the irritability of involuntary parts, diminish sensibility, and depress the organic nervous influence*, especially hemlock and its alkali, conia, hydrocyanic acid, and the cyanides, carbonic acid, sulphuretted hydrogen, &c.; stramonium, cannabis indica, tobacco, digitalis, the preparations of lead, &c.

38. The substances which act energetically upon the nervous system, in impairing either the sensibility or the irritability and the voluntary movements of muscular parts supplied by nerves respectively belonging to these systems, have not their actions limited to one of these functions only, although either may be more prominently affected according to the poison employed. Their effects may, moreover, be extended even to secreting and excreting organs, such poison acting more or less on particular functions than on the others. When either of these substances is taken into the stomach in quantities which are injurious, not only are the nerves of the part affected, but absorption of the poison takes place to a certain extent, and the injurious impression made upon the nerves by it is transmitted along the organic and sensory nerves to the ganglia, brain, and spinal chord, which are further affected according as the substance is present in the circulation. Some of these poisons seem to affect one order of the nervous system more than another; certain of them impress more especially the organic or ganglial nervous system, deranging the several functions depending chiefly upon it, others affect the brain, consciousness, and sensibility, and impair more or less the voluntary movements, and other allied functions; and these several results are moreover varied not only with the quantity of the poison taken, but with the circumstances connected with its exhibition and the constitution and temperament of the person who is its victim.

39. iv. *Certain poisons produce a septic action, weakening and dissolving the vital cohesion of tissues, or softening and even liquefying the structures.* These substances not merely depress the organic nervous energy of the parts with which they come in contact, but they also produce a physical or chemical change in the tissues, contaminating the fluids, and favouring the imbibition and absorption, not only of the poison itself, but of the contaminated fluids of the poisoned part. Animal matters act chiefly in this way, more particularly the poisons of serpents, of fish, decomposing or putrid animal substances, the animal poison generated in sausages and preserved or dried meats, the secretions and fluids in disease, or after death; especially after malignant and infectious maladies, and still more especially if any of these be applied to a punctured wound, or to an abraded surface. In most instances the local action of these poisons is evinced by the part being pained, swollen, livid, or otherwise discoloured, soft or boggy, sometimes numbed, and changed in temperature, often rapidly passing from a burning heat to coldness, or being cold from the commencement. These changes proceed from the extremities to the trunk, from the periphery to the centre, and extend more or less rapidly, with remarkable sinking of vital power, a very quick or irritable pulse, and manifest indications of contamination of the fluids and soft solids, more especially when the poison has been applied to an external surface, or to a wound. When it has been taken into the stomach, distressing nausea, vomiting, anxiety, and feeling of sinking, evidently owing to depression of the organic nervous energy, are then generally observed, with other symptoms varying with the particular poison which has been taken, as cutaneous blotches or eruptions, coldness of the surface, suppression of urine, rapid weak pulse, watery stools, &c. &c.

40. The animal poisons which act in the way now described affect chiefly the *vital conditions* of the parts to which they are applied,—depress organic nervous influence, and loosen the vital cohesion of the tissues, whilst they contaminate the fluids; but there are other substances, which soften, or liquefy the tissues, in consequence rather of a *chemical* than a vital operation, although the vital conditions are also to a certain extent affected. These are the *alkalies*, the sub-salts, or those saline substances in which the alkali is the predominant element, the biborate of soda, the iodide of potassium, the alkaline sulphurets, the preparations of antimony, of mercury, &c., when used in large quantity or long employed. These substances act locally, more or less energetically as now stated, especially the pure alkalies; but they are also rapidly absorbed, and they then alter the vital conditions of the nervous and vascular systems, and the chemical constitution of the blood, especially as regards the red globules and fibrine, the proportions of which they even diminish, especially when they have been employed for a considerable time. When thus used, they also liquefy, and favour the absorption of morbid growths or tumours, whilst they relax generally the soft solids.

41. v. *That various poisons excite the ganglial, spinal, and sensory nerves, or either of these orders of the nervous system, more than the others*, will be admitted; but this effect is generally varied and associated, according to the nature of the particular substance employed, with other changes manifested by secreting surfaces and organs. The stimulating operation is evidently exerted primarily upon the nervous organization of the part to which the substance is applied; and, for a time, it tends to concentrate the nervous power, and even vascular determination and action, towards the surface or viscus thus acted upon. Subsequently, however, the effects become more or less diffused; but the rapidity of the diffusion of the stimulating influence over the frame depends upon the nature and quantity of the substance employed, the state of the organs upon which it has acted, and the temperament, constitution, and habits of the subject acted on.

The principal question is—whether or no the general or remote effects are produced by nervous influence, or by the rapid passage of the substance into the circulating fluids, and the consequent operation of it upon the several organs and structures of the frame, or by both these modes, either of them predominating according to the circumstances just stated?

42. *A.* As to the action of stimulants on the nervous system, on either the ganglial, the sensory, or motory, or upon any two or all of these divisions of the system, there can be no doubt as respects that part of it supplying the organ to which the poison is applied; the question being as to the extension of the stimulating operation to distant parts by means of this system. Formerly, the remote effect was imputed altogether to this system, the other mode of action just referred to being overlooked or discarded. From 1819 until 1826 I made many experiments with stimulating substances and tonics, vegetable and mineral, some of which were published in the journals of the day (especially in the London Medical and Physical Journal, and London Medical Repository) with the view of determining the modus operandi of many active agents upon the frame; and I demonstrated, beyond dispute, that this is not the only mode of action, as regarded the great majority of them, which, although acting more or less in this way, operate also, and even mainly, through the medium of the circulating fluids.

43. That the stimulating impression made upon the organic or sensory nerves of the viscus to which the substance is applied is transmitted, more or less remarkably, by means of these nerves to remote parts, which it thus affects, appears extremely probable; for there are several analogies, considerations, and even proofs, both physical and pathological, of this being the fact; and, moreover, these remote effects are often reflected upon other distant parts. Thus the stimulus existing in, or acting upon, an internal viscus, may be transmitted by the organic nerves to the adjoining ganglion, or to the great semilunar ganglion, or to the spinal chord, or to the brain, becoming an object of either obscure or distinct sensation or consciousness, and there the effect may cease, or be reflected thence upon other parts, affecting the actions of involuntary organs, through the media of ganglial nerves, or exciting the movements or sensibility of voluntary parts through the medium of the spinal chord. The remote effect may be produced more or less by either order of nerves or nervous masses, ganglial, cerebro-spinal, or sensory and motory, according to the nature and quantity of the substance employed, and the mode of employing it. Much of the misconception and confusion which have existed as to the operation of agents on and through the medium of the nervous organization have arisen chiefly from the following circumstances:—1st. Experimenters have considered the organic nerves as forming a part of those proceeding from the cerebro-spinal axis;—2d. They have viewed the distinct orders or divisions of the nervous system as identical, and as performing the same functions;—and 3d. They have overlooked the fact that it is impossible to separate the vascular system from the nervous, so as to isolate each, and that it is equally impossible to cut off the nervous communications existing in distant parts whilst the arterial communications are allowed to continue, inasmuch as all arteries are surrounded by a reticulum of ganglial nerves. It is owing mainly to these circumstances, and their consequences, that so many ill-planned and ill-performed experiments on living animals have been made—experiments which could furnish no correct inferences, which, moreover, were undertaken to decide points not admitting of being thus decided, and which could not prove the basis of even a loose hypothesis, far less of sound doctrine. Considering, therefore, as will appear more fully in the sequel, that poisonous as well as medicinal agents produce an impression upon the nerves of the part to which they are applied, that is not limited to such part, but which often affects sympathetically distant parts, although in various degrees and modes, according to the nature and state of the substance employed, I proceed to remark upon the operation of stimulants through the medium of the circulation.

44. *B.* That numerous stimulating substances—vegetable, saline or mineral, and animal—are more or less rapidly imbibed by the tissues, and absorbed into, and are afterwards eliminated from, the circulation, are amongst the best established facts in physiological science. The effects which these substances produce, when taken either medicinally or in hurtful doses, are chiefly owing to this mode of action, although the impression primarily made by them on the several divisions of the nervous system is also more or less influential in producing these effects; but the exact extent of that influence can hardly be determined. That the majority of stimulating substances are actually absorbed into the circulation, to an extent varying with the substance employed, and the state and mode of its employment, has been fully established, inasmuch as they have been detected in the blood itself, and in the several secretions and excretions. The special operation of many stimulants thus depend not only upon their primary impressions upon the nervous system, but also upon their presence in the blood, and their action on the nervous masses and centres, and more specifically upon the functions of certain organs and surfaces, particularly upon those organs by which they are eliminated from the blood. The alcoholic, the ætherial, the balsamic, the camphoraceous, and several other classes of stimulants—both vegetable and mineral—act in the way now stated.*

45. vi. That many poisonous substances are *capable of astringing the tissues and of increasing the tone or vital cohesion of certain structures, when employed in small quantities, cannot be doubted:* but this effect more rarely follows their employ-

* During 1819, 1820, and 1821, I made a number of experiments upon the operation of several active substances; and the results of those which I made with the terebinthinates were published in the *London Medical and Physical Journal* for July 1821. At that time it was generally believed, that medicinal as well as poisonous substances acted upon the nervous system directly and entirely, the results depending altogether upon this system without reference to the blood and vascular system, and without distinction between the organic, the sensitive, and the motory divisions of the nervous system. I believe myself to have been, if not the first, at least amongst the first, to determine by experiments the action of these substances through the medium of the blood, and to show that many of these substances act differently upon the different orders of the nervous system—upon the organic nerves either chiefly, distinctly, or differently from their action on the cerebro-spinal. (See *Lond. Med. and Phys. Journ.*, July, 1821, p. 112 *et seq.*, and August, 1821, p. 185. *et seq.*)

ment as poisons, unless in the case of mineral poisons; and then the operation of these, especially when used in large or injurious quantities, is more chemical than vital; several of them, as the mineral acids and salts, combining to a certain extent with the tissues and the liquid elements of the tissues, altering the constitution of the capillaries and of the capillary contents, and thereby affecting the state of vital function and action. Many of the substances which act as stimulants, by the greater permanency of their effects, and by their action, in the manner now stated, upon the tissues, have an astringing operation. Substances acting thus on the œconomy have not their effects always limited to the parts to which they are applied; for I have ascertained that they are absorbed, especially when much diluted, or when dissolved, into the circulation, and are afterwards carried out of it chiefly by the kidneys and skin. The metallic salts and the mineral acids severally act in this way more or less rapidly, energetically, and manifestly; and produce their effects on parts of the frame the most remote from those to which they were applied. The metallic sulphates and nitrates, the superacetate of lead, the balsams and resins, the phosphoric, the mineral, and many of the vegetable acids, although acting in the way now stated, severally produce other effects, when employed in hurtful quantities. Some of them excite certain of the organs concerned in excreting them from the circulation, others of them depress or exhaust the organic nervous influence and the irritability of the heart and other contractile parts; and many of them alter the constitution of the blood, especially of the red-globules and fibrine, so as to render this fluid unsuitable to the perpetuation of the nervous and vital functions.

46. vii. *Numerous substances act especially upon the irritability of contractile parts, and either impair or increase this vital property*, according to the nature of the substance. These modes of action evidently result from the impression produced either primarily upon the organic nerves of the part, or consecutively upon the ganglia, the poison having been carried into the circulation, or from both these modes of operation. Prussic acid and the prussiates, monkshood, tobacco, aconite, digitalis, arsenious acid, colchicum, antimonials, borax and boracic acid, ergot of rye, nitre, and several other substances, when employed in large doses, *depress* the organic nervous power, and the irritability of involuntary organs, especially of the heart, without directly impairing the functions of the brain and spinal cord, and of voluntary parts, although affecting them through the media of the ganglial and vascular systems. Other substances affect the irritability by increasing it at first and *exhausting* it afterwards, the effect varying with the substance and the quantity employed. This operation probably obtains in respect even of some of the articles just enumerated, as arsenic and antimony. Other substances *excite* the irritability of both voluntary and involuntary organs more or less remarkably, as nux vomica and strychnia, brucia, St. Ignatius's bean, snake-wood, &c.

47. viii. *Numerous articles act more especially in augmenting certain secretions and excretions;* and they produce these effects either by their direct action on the organs to which they are applied, or by their consecutive operation, through the medium of the circulation, upon the organs and surfaces which they specifically influence. Thus emetics and purgatives taken into the stomach excite or irritate the organic nerves supplying the villous surface of the alimentary canal, and thereby increase the secretions and involuntary movements of the tube, each substance possessing either an emetic or a purgative property acting in a manner more or less peculiar to itself, and producing, moreover, in some cases, additional effects. Other substances, as many of those which act upon the kidneys, as the terebinthinates, several salts, particularly the nitrate of potash, the nitrate of soda, the acetate of potash, cantharides or its active principle, and various other articles, are absorbed into the circulation, and excite especially the kidneys so as to increase their secretion, or even to over-excite or inflame them. Other substances, through the medium of the circulation, affect the exhalations and secretions from the bronchi; and others, again, those from the skin. But this subject need not be further pursued, at this place.

48. ix. *That some articles irritate particular organs or parts in a way more or less peculiar to these articles*, either when directly applied, or absorbed and carried in the blood to the organ affected by them, may be admitted. But although this operation, and those just noticed, constitute the chief modes in which substances are expected to act medicinally — their principal therapeutical effects,— yet they are merely subordinate to the more energetic or violent results produced upon the nervous influences and vital actions, when the same substances are employed in hurtful quantities.

49. x. *In connection with this irritating operation, varying with the substance employed and the mode of its employment, an alterative action is also produced; the vital functions — the secretions, the sensible qualities and conditions, and the nutrition, of particular organs and parts being changed in kind or character, as well as dynamically or in degree.* These effects are manifested chiefly when poisonous substances are given repeatedly in small doses, are employed medicinally, or with the view of producing deleterious effects slowly and latently. Numerous medicines have acted injuriously in this way, as well as in the two preceding modes, in consequence of having been employed injudiciously — inappropriately as respects the nature of the disorder, and either during too long a period, or in too large or too frequent doses, the effects thereby produced having been mistaken for the progress of the disease. When substances have thus produced an alterative effect or change of action in any one or more organ or part, they have generally been absorbed to a greater or less extent into the circulation, and have operated, through the medium of the blood, on the tissues, or on the organs eliminating them from the system.

50. xi. *Substances which irritate or excite inordinately the parts or tissues to which they are applied, determine or solicit increased circulation and vital action to these parts, and proportionately diminish vascular action in distant parts, or in the viscera less intimately connected or associated in function with those on which these substances act directly.* Many articles are employed medicinally with the intention of producing these effects — as *revulsives, derivatives*, or *revellents;* and many of the phenomena observed as consequences of poisoning depend upon this revulsive or derivative ope-

ration. This effect arises chiefly from the influence of the organic nerves, which, when irritated, influences the circulation in the associated capillaries and arteries, increases the vital expansion and action of these vessels, and augments the exhalations and secretions from them; the results varying, in kind and in grade, with the irritant or substance thus affecting the organic nerves of the part to which the increased action is thus determined.

51. VI. The Circumstances which modify the Effects of Poisons require to be briefly noticed. (*a.*) The *quantity* used materially affects the action of a poison, so much so that the most virulent poison is medicinal or even salutary when taken in minute doses. Thus prussic acid in a very small dose is soothing and antispasmodic, in a large dose it annihilates the vital action. Several poisons, in small quantities, slightly irritate or inflame the digestive canal, but in larger doses they produce convulsions, coma, and death.

52. (*b.*) *The aggregation and degree of dilution* very materially modify the operation of a poison. The more minutely a deleterious substance is divided, and the more completely it is dissolved in oil or in water, the more energetically and the more rapidly it will act, especially when taken into the stomach. This necessarily follows from the preparation thus made for the action of the poison over a large surface, and for the imbibition of it by the tissues and absorption by the vessels. Certain substances, which are extremely active when thus prepared, remain for some time inactive when they have been taken in a concrete or aggregated state. The dissolving influence of the juices of the stomach, and of the secretions poured into the duodenum, is not without influence upon certain poisons, when taken in an undissolved state; for the carbonate of barytes and arsenite of copper are more soluble in these than in water. The operation of poisons is further changed by aggregation and by degree of dilution. Camphor, in weak dilution, is cooling, sedative, and soothing, in stronger dilution in oil, or minutely divided in mucilage, it is exciting, and, in still larger quantity, productive of delirium, coma, or convulsions; and in fragments it may occasion inflammation, or even ulceration of the part to which it is applied. Certain poisons in a state of vapour, or even substances which cannot, in their usual states, be viewed as poisons, when employed in a state of vapour may become poisonous, if they be applied to extensive surfaces of the frame. Thus the inhalation of the vapour procured from numerous ascertained poisons, narcotics, and others; or of the vapour of æther, of alcohol, and of certain volatile oils, when continued even for a short time, rapidly affects the frame, owing to the remarkably great extent of living surface to which substances in a state of vapour are thus directly applied, to the extent of the impression produced by them on the organic nerves, and to their rapid absorption into the circulation.

53. (*c.*) *Chemical conditions or combinations*, and the states in which chemical substances are employed, modify the effects produced. Some chemical substances, when employed in a concentrated state, act locally merely, as the mineral acids; but when taken internally in a state of weak dilution they are carried into the circulation, and act upon and through the medium of the blood. Morphia, being insoluble, is comparatively inert, unless very minutely divided, but when dissolved in a fixed oil, or in alcohol, or combined with an acid, it becomes very active; and numerous substances which, in an uncombined state, were most deleterious, become innocuous when chemically combined with their opposites, as alkalies with acids, and *vice versâ*. But this topic is so trite that I need not pursue it further.

54. (*d.*) *Admixture* of various substances, alimentary or others, either before or after ingestion, varies the effects; generally by diminishing the activity of the poison, owing to slow absorption and imperfect or intercepted contact with the villous surface of the stomach. If, however, the poison be taken in a state of complete solution, and if the substances taken with it, or those already present in the stomach, serve to dissolve or minutely divide it, they may not impede, but, on the contrary, ensure its action. If it be swallowed in a state of imperfect division or in fragments, the alimentary or other substances given with it may so involve these particles, or the mucus of the surface may so protect the organ, as either to diminish its effects, or to occasion vomiting, by which it may be altogether or partly thrown off. Dr. Booth has recorded an instance of an ounce of corrosive sublimate having been swallowed after a full meal, without any remarkably bad effects having been produced, full vomiting having been speedily induced, and other cases are referred to by Dr. Christison (see above, § 3.).

55. (*e.*) *The organ or tissue* to which a poison is applied has been already stated materially to influence its action on the œconomy, both locally and generally (§§ 3—10.). It has also been stated that the cuticle protects the skin more or less from the action of poisons, even the most corrosive and subtile; and it is not until it be removed or destroyed that the poison acts, or if it act, the effect is much more slowly produced. The mucous surfaces are much more readily acted upon: still the mucus and epithelium covering them protect them to some extent, and render them less susceptible of the poisonous impression, and less prone to imbibition and absorption, than serous surfaces, or denuded or incised parts. These latter parts, or wounds of any description, may, however, escape, if they bleed so freely as to wash away the poison. The rapidity of action varies much with the tissue to which the poison is applied; and is manifestly attributable to the celerity with which absorption proceeds in such tissue, and the extent of surface presented to the poison. Thus it is very rapid when a fluid poison is injected into the bronchi.

56. It is worthy of mention, as remarked, but not explained, by Dr. Christison, that the poisons which seem to operate energetically on the sentient extremities of the nerves, and indirectly through the brain and spinal cord, act not at all upon the divided surfaces of the brain and large nerves, or upon the course of the latter; as proved in respect of prussic acid, opium, strychnia, and several narcotics. This circumstance may be partly owing to the mode of operation of poisons above contended for,—viz. upon the organic nerves, or the organic and sensory nerves chiefly; the application of them to a cut portion of the fibrous structure of the brain, or of a nerve, not being likely to produce any further effect than what may arise from the

division of certain fibres of these structures. The effects of poisons on different parts depend much upon the vascularity and the disposition to imbibition and absorption possessed by the texture to which the poison is directly applied. The connexion also subsisting between the texture and the more vital organs, especially the dependence of the part upon the organic nervous system; the state of the vessels, the amount of hæmorrhage from them, and a variety of circumstances, also modify the results.

57. Mineral and vegetable poisons are much less controlled or influenced in their action by the organ or tissue to which they are applied than animal poisons are. The digestive canal and its secretions change the usual operation of mineral poisons but little; some vegetable poisons are somewhat more modified by the digestive organs, in certain cases; but several animal poisons, which, if applied to a denuded surface, or to a wound, would be rapidly fatal, may be so altered by these organs as to be productive of but little disorder, when taken internally.

58. (*f.*) The operation of various poisons, especially of narcotic and sedative substances, is modified also by *habitual use* of them, and by *idiosyncrasy*. Whilst use diminishes the poisonous effect, idiosyncrasy more commonly increases it. A person who has become addicted to opium, or even to some other narcotics, may take as much at once, with advantage, as would destroy the life of a person not accustomed to the substance; and a person may be almost poisoned by a substance, or an article of diet, as a particular kind of fish, that would not disorder others. The influence of habit or use is shown chiefly by the organic poisons, particularly those already mentioned. Inorganic or mineral substances have not their injurious operation so remarkably impaired by use. Dr. CHRISTISON supposes that this "effect of habit is nothing more than an increased power acquired by the stomach of decomposing the poison,—just as it gradually acquires an increased facility in digesting some alimentary substances which are at first indigestible." (p. 29.) This may be the case in part; but something is probably also owing to a gradually diminishing susceptibility of the impression produced by narcotics in the organic nerves, and of the nervous system generally, owing to their frequent exhibition.

59. (*g.*) The *moral and physical states* of the system also modify the operation of poisons, especially of organic poisons,—narcotics especially. Great mental excitement, anger, passion, &c., delay, or, to a certain extent, counteract, the operation of narcotic and sedative substances; whilst the depressing passions hasten and ensure their effects. Several diseases, especially those of the nervous systems, as tetanus, rabies, mania, hysteria, &c. admit of large doses of opium, or of other narcotics being given without injurious effects. Other substances, however, which are more sedative than narcotic, as tobacco, colchicum, prussic acid, &c., and which act more upon the heart, are not tolerated so manifestly during these diseases. Febrile diseases, especially during the stage of excitement and increased vascular action, delay or counteract in some degree the action of some poisons; whilst the same maladies, and more especially pestilential fevers and pestilential cholera, particularly during the stage of exhaustion, show that the frame is more or less insusceptible of the impression usually made by poisons. This want of susceptibility is owing to the low or exhausted state of vital function throughout the body, and to the absence of those vital conditions, or the commencing departure of these conditions, by means of which agents act upon living bodies.

60. Other diseases, or a predisposition to them, as to apoplexy, palsy, or congestive states of the brain, diseases of the heart, inflammatory states of the stomach or intestines, congestions of the liver, &c., may severally favour the operation of certain poisons, whilst these latter may excite or determine an attack of these maladies. Where there is an apoplectic or paralytic tendency, a small dose of a narcotic may occasion a serious effect, or even produce a seizure; and, when there is serious organic change in the heart, a large dose of a sedative, as of hydrocyanic acid, colchicum, or even a moderate dose, may terminate life. The irritant poison, which may be innocuous in some instances, may be fatal in others, where disease of the stomach or bowels, or a tendency to it, already exists; but this subject requires no further illustration. It should also be kept in recollection, that blood-letting either soon after or before a poison has been taken, accelerates the action of such poison, if it remain in the part, by promoting its absorption.

61. VII. CIRCUMSTANCES WHICH SHOULD SUGGEST SUSPICIONS OF BEING POISONED.—(*a.*) *The sudden appearance of severe symptoms whilst the patient is in health.* It is comparatively rare that a substance can be taken in an injurious quantity without almost immediately producing serious ailment. Without denying the occasional production of slow poisoning by the practised poisoners of the middle ages, and of the succeeding two or three centuries, it may be admitted that this mode of poisoning was not so frequently attempted or accomplished as generally supposed. At the same time it should not be overlooked that poisons may be administered, as they sometimes have been, during the *illness* or the *intoxication* of the poisoned person, in order that the act may appear as the result of these states. The poison may even be added to the patient's medicine, or substituted for it, as has been shown on several occasions. Generally the symptoms of being poisoned appear either immediately or within an hour after the poison has been taken; and it very rarely occurs that they are deferred beyond two hours, or three hours at the farthest. There are occasions, however, in which slow poisoning may occur unintentionally, and the symptoms be gradually and very slowly developed. I have met with several instances in a somewhat long course of practice of active and cumulative medicines having been given in large or frequent doses for so long a time as to produce dangerous and even fatal effects, these effects having been mistaken, owing to the ignorance of the practitioner, for the progress and issue of the natural disease. Colchicum, digitalis, tobacco injections, opiate injections, tartar emetic, the preparations of iodine, and several other substances, have thus produced effects for which they did not receive the credit.

62. (*b.*) *The appearance of severe symptoms after a meal, or after taking any substance, fluid or consistent, into the stomach, or after any substance has otherwise been exhibited or applied, should also be a*

source of strong suspicion. What I have said above (§§ 2—11.), as to the several modes of poisoning, is sufficient to show that poisoning may be produced in various ways, besides the more usual way of mixing the poison in the food or drink of the poisoned person. When, therefore, violent or fatal symptoms occur suddenly, or proceed rapidly, diligent inquiry should be made as to the time, nature, and kind of the patient's last meal, as to the circumstances and occurrences to which he has been exposed, as to the persons with whom he last had communications, and as to his habits, and morbid tendencies. It should be kept in recollection, that disease may exist, even for a long time, without occasioning suffering so great as to prevent his usual avocations; and that the stomach itself even may be the seat of disease, and yet a full meal may be taken, after which the most violent symptoms may supervene suddenly and carry off the patient. This is not an infrequent occurrence in cases of perforation of the stomach met with in practice, especially in young women (see Stomach, *Diseases of*). A fatal result, presenting the symptoms of poisoning, may also follow the ingurgitation of a large meal, or of indigestible substances, after long fasting, or of cold fluids when exhausted.

63. When several persons have partaken of the same meal, or of the same substances as the individual who has been attacked with severe illness, the circumstance of the greater or less disorder of all, according as a particular article was partaken of, or the escape of any or of all, with reference to the meal generally, or to any particular article which it comprised, should receive due consideration. For, when all or several of those who have partaken of the same meal suffer more or less, the suspicion of poison amounts almost to proof; whilst the illness of one merely, others who had partaken of the same article not being affected, is a presumptive indication of the disorder being owing to other causes. In estimating, however, matters of this kind, the liquors and fluids drank, and the congruous nature of these, the one with the other, and with the several articles of diet also partaken of, should be taken into the account. Although it may be inferred, that all who partake of the same poisoned dish will suffer according to the quantity partaken of, yet such is not always the case; for the poison may be unequally mixed in the food; and, as respects certain poisons, especially those most frequently employed in this manner, as arsenic, a larger quantity of the poison may prove more innocuous than the smaller quantity, for the former may be vomited, whilst the latter may be retained and act most violently.

64. It ought to be recollected that various articles of diet may produce symptoms which may be more or less severe in all who have partaken of either of these articles, and these symptoms may depend upon the nature of the article itself, and not upon the admixture of any poison. Nevertheless, the article of diet is poisonous; but there is generally in this case no criminal poisoning; for the state and probable effects of the article is generally unknown, and not suspected by any one until the effects appear. Rancid bacon, unclean or improperly fed fresh pork, dried or ill-cured meats and sausages, various kinds of fish, whether diseased or imperfectly cured, or kept too long; the flesh of diseased or over-driven animals; several kinds of shell-fish, especially when out of season, tainted or fly-blown meats, &c. are often productive of irritating and depressing, or acro-sedative, effects, and have suggested the arrangement of these articles in the class of poisons which act in this manner.

65. (*c.*) *The state of the patient's spirits or feelings previously to his seizure, and other matters which circumstances may suggest, should receive attention.* Acute observation and inquiry exercised with due discretion and proper feeling by the physician, will often throw considerable light upon the origin and the agent of poisoning — will indicate either the accidental, the suicidal, or criminal nature of the act. The acumen required in such circumstances as present themselves in connection with poisoning cannot be aided by what I can say on the topic: it will generally be sufficiently exercised by the well-educated practitioner of the present day; but the following should be more particularly observed, in all their relations, as upon them depend not only the recognition of the poisonous substance, but the treatment and life of the poisoned person, and the discovery and punishment of the guilty.

66. Matters requiring the Attention of the Physician when Suspicions of Poisoning are excited. — When severe illness occurs in the circumstances just noticed, endeavours should be used to ascertain every particular as to circumstances and manner of its appearances. The vessel, utensil, or bottle, or paper which contained the injurious or suspected article; the remains of such article, whatever it may be, and of the food or drink which had more recently been taken; the matters thrown off the stomach, and the substances on which the suspected article has been spilt or rejected, should be carefully examined in order to ascertain the nature of the poison; and, in cases of criminal poisoning, they ought to be preserved and chemically investigated, as fully set forth in works on *Medical Jurisprudence.* If death take place, the examination of the body as to position and external appearances should be minute, and the contents of the alimentary canal, and of the urinary bladder, as well as the digestive organs, and, in some instances, other organs also, should be carefully investigated, both anatomically and chemically, in order to ascertain the actual presence of the poison, and the amount of structural change produced by it. Numerous other matters connected with the poisoned person, and with the appearances of the various objects around him, both before and after death, ought to be noted, but, as these have especial reference to judicial proceedings, I must refer the reader to medico-legal works, especially to what has been stated by Mr. Taylor in his "*Medical Jurisprudence.*"

67. VIII. The Symptoms caused by Poisons cannot be duly considered until I treat of the operation of individual poisons. I may however remark, that the symptoms usually assigned to many poisons have not been observed with accuracy nor described with due precision; and that they do not in many cases admit of either accuracy or precision, as they vary with the dose of the poison and with the circumstances shown above (§§ 51. *et seq.*), to modify them more or less. It will be seen from the *arrangement* I have adopted in discussing the action of particular poisons, that I have attempted to take a more intimate view of the effects produced by them than has usually been taken, and to base upon these effects

a classification which may aid not only the recognition of the injurious agent, but also the adoption of appropriate means for the removal of these effects. It must have been manifest to all who have observed the operation of poisons, that many acrid or irritant poisons do not produce nearly the same nor similar symptoms; that several substances which have been arranged as acro-narcotic poisons produce no narcotic effects, unless contingently; that vitally depressing agents have been classed with pure narcotics, the effects resembling narcotism sometimes observed being merely those of departing cerebral functions, and that the effects which have been imputed to local irritation only have been quite as much owing to change of function throughout the œconomy, or to extreme vital depression. M. ORFILA, who has devoted himself so ably and remarkably to the subject now before me, and has performed so many experiments with poisons on the lower animals, has certainly reduced the classes of poisons to a too limited number, and has erred in considering many of the symptoms, as well as of the lesions after death, to have been caused by the poisons experimented with, instead of viewing them as partly the results of the injury inflicted on the animals the subject of experiment. Other experimenters no less deserve the same imputation. When he as well as they inform us that certain poisons were given to dogs, that in order to prevent their rejection by vomiting the œsophagus was tied, and that, in addition to various lesions thereby produced, the lungs were found congested or inflamed, can we be warranted in assigning the pulmonary lesion to the poison only? Is not some part of these or of other lesions observed, owing to the injury inflicted by the operation or by the ligature on the nerves in the vicinity, or on those actuating the œsophagus or adjoining parts?

68. i. The more intimately and accurately the symptoms of poisons are observed, the more easily will they be distinguished from natural diseases; and it is of the utmost importance that the former should not be mistaken for the latter. The distinctions will be noticed in the sequel; but I may here state, that the features of *gastritis, enteritis, gastro-enteritis, peritonitis, bilious and malignant cholera, the several forms of colic, malignant or adynamic dysentery, internal strangulation of the intestines, strangulated hernia, and perforations of the stomach or intestinal canal*, may be very closely simulated by poisoning with most of the substances classed under the heads of *acrid and corrosive, acro-sedative, acro-alterative, and septic poisons* (§ 106.); the particular features of the assumed disease varying with the particular poison, the quantity taken, and the various circumstances already shown to modify its operation; and that *apoplexy, epilepsy and convulsions, diseases of the brain or spinal marrow, diseases of the heart, rupture of internal viscera or of large vessels, and spontaneous congestion of the lungs*, may likewise be simulated by the operation of many of the poisons ranked under the classes *depressing and paralysing, exciting and exhausting, narcotic or stupifying, and narcotico-acrid*, the particular or special effect varying according to the circumstances just alluded to.

69. From this it will readily appear, that the difficulty of inferring, with any degree of accuracy, the particular poison which has been taken, from its effects only, is extremely great; and hence the necessity of obtaining further information as to its nature from what may remain of the vehicle in which it has been taken or otherwise employed, from the matters vomited or evacuated by the bowels, and from other sources or circumstances. In examining the symptoms caused by poisons, care should be taken to estimate as accurately as possible the remaining vital and nervous energy of the patient, to ascertain by the hand and by the ear, or stethoscope, the impulse and energy of the contractions of the heart, to observe the manner in which position affects the state and feelings of the patient, as well as the pulse, and to distinguish between effects which are truly narcotic, and those which are still more serious, viz. those proceeding from extremely depressed or departing vital manifestation of the brain. Equal care should be exerted not to mistake increased irritability for excitement or augmented power, and not to confound a very rapid or a very open and compressible pulse with consecutive inflammation, although inflammation may be actually induced, but it is of an asthenic or spreading kind, when it thus appears; for these states of the pulse may arise merely from some degree of remaining irritation, from the alterations produced in the blood, or even from a portion o f the poison still irritating the organic nerves and vascular system. In fine, care should be taken not to mistake the constitutional commotion consequent upon vital shock and exhaustion for sthenic or increased vascular action; and not thus be induced to deplete and lower the system when we should calm its agitations and support its powers.

70. ii. The DURATION OF POISONING necessarily varies with the virulence of the poison, with the quantity taken, and the repetition and frequency of the dose, and with the circumstances stated above, as modifying the operation of poisons (§§ 51. *et seq.*). Owing to these and a variety of other causes, appertaining either to the nature of the poison or to the state of the poisoned person, and to the effects more immediately resulting from a combination of these, poisoning may be — 1st, *acute or rapid*; — 2d, *chronic or slow*.

71. *A. Acuteness* or *rapidity* of action is usually the result of the virulence, and quantity of the poison; but, owing to the greatness of the quantity, the poison may be rejected by the stomach, and the expected result may either fail, or be more slowly produced. The state of the stomach, especially as respects the contents of the viscus, may also cause a similar issue, by absorbing much of the poison, and protecting the stomach from it.

72. *B. Chronic* or *slow poisoning* may result — 1st. From the lesion caused by a large dose of an active or virulent poison, which, although insufficient of itself to produce immediate or rapid death, owing to the above or other causes, is still sufficient to occasion changes leading, more or less directly, and manifestly, to a fatal issue, *acute* thus subsiding into *chronic* poisoning; — 2d. From the nature and quantity of the substance, which had been given in such a dose at first, as to produce a slow but fatal effect; — 3d. From the repeated ingestion of small quantities, which have gradually developed structural changes, or which, by their cumulative and latent influence, have ultimately burst forth into active operation. — Illustrations of these several manifestations of the effects of poisons will appear in the sequel. Of

the writers, who have discussed the action, the effects and the treatment of poisons, none has so judiciously marked the distinction between *acute* and *chronic poisoning* as Dr. Pereira, in his very distinguished work on the *Materia Medica*.

73. IX. The General Diagnosis of Poisoning. — The Diagnosis of poisoning in the *living* and *dead body* is *general* and *special*. The *former* I shall briefly advert to; the *special diagnosis of poisons, or of poisoning*, requires a recourse to the most precise analysis, to chemical manipulations and chemical tests, and falls not within the scope of my undertaking. — i. *The general diagnosis of poisoning during life* has been partly considered in the preceding sections (§§ 28—72.), and it is more fully exhibited in the description of the several poisons about to be noticed; but further evidence is to be obtained from the presence of poison in, or the absence of it from, the articles or fluids partaken of by the patient, and from the matters vomited by him. When poison is found in the matters vomited in the presence of a medical or scientific man, the proof of poisoning is much stronger than when it is found in the remnants of food partaken of; inasmuch as it is evident from this, that the poison has actually been taken, whereas, in the latter case, it may have been put into the food with some sinister purpose, and not have been swallowed at all. Mr. Taylor justly remarks, that it should be recollected, whilst investigating a case of poisoning in the living subject, that this act is sometimes *feigned*, and at others *imputed*. It is very easy for an evil-intentioned person to put poison in food and to accuse another of having administered it, and to introduce poison into the matters, either vomited or discharged from the bowels. The detection of poison in the matters thrown off the stomach, affords no decisive proof that it has been swallowed, except under two circumstances: — 1st. When the accuser actually labours under the usual symptoms of poisoning; in which case there can be no feigning. 2d. When the matters are undoubtedly vomited into a clean vessel, in the presence of the medical man, or of some person on whose testimony perfect reliance may be placed; these matters never having passed from his view, from the moment of their rejection from the stomach until their analysis, examination, or due custody, under proper seals.

74. *A. The time at which death occurs after the first symptoms of poisoning* is of importance, inasmuch as death from natural causes rarely occurs in so short time as from poisoning. Having ascertained all the circumstances connected with the attack, and all the symptoms manifested from the moment of attack until death, the exact time which has elapsed from the former period until the latter should be correctly estimated, as one of the elements for the formation of an accurate opinion as to the existence or non-existence of poisoning, and even as to the particular cause or agent of it. When a poison has been given in large quantity, the result may be supposed most likely to occur in the shortest time in which it is usually found to act. But the circumstances pointed out above (§§ 52. *et seq.*) may delay its action or its ultimate effects. Poisons not only differ from each other in the period they take to produce a fatal result, but the same poison differs remarkably in this respect in different persons, although the several circumstances, as far as they may be known, appear to be nearly the same. Hence it is difficult to determine the shortest period in which a given poison will destroy human life, when swallowed in large quantity; and little reliance can be placed upon the circumstance of an imputed death from a certain poison having occurred too rapidly or too slowly, as a proof of its not having been taken; for, an empty state of the stomach, the retention of the poison, and an exhausted state of the poisoned person will accelerate, and a full stomach and free vomiting will delay, the fatal result. On this subject Mr. Taylor states, that a large dose of strong *prussic acid*, *i. e.* from half an ounce to an ounce, will destroy life in from ten to twenty minutes. In one case of this kind of poisoning, the particulars of which I had occasion to investigate, death must have taken place in about five or six minutes. If the person who is poisoned by this acid survive an hour, or even less, there are hopes of his recovery. *Oxalic acid* may prove fatal, in the dose of from half an ounce to one or two ounces, in a period varying from ten minutes to an hour, — and if the poison be not dissolved when swallowed, the period may be very much longer. The *strong mineral acids* destroy life, in large doses, in from twelve or sixteen hours to twenty-four hours. *Arsenious acid* usually is fatal, in periods varying from twelve hours to two or three days; but it may cause death in much shorter periods — in one, two, three, or four hours — an hour being about the shortest time. Mr. Taylor, however, remarks, that there is nothing to prevent arsenic from destroying life in one hour: and that, in a case, which was most probably one of poisoning by arsenic, death took place in half an hour. The shortest time in which *Opium* has been said to destroy life is three hours; but the period usually varies from six to twelve hours; but with it, as with all other poisons, the fatal issue may be protracted long beyond the limits mentioned of the more common period.

75. Whilst the rapidity with which death from poison may take place is duly recognised by both professional and other persons, the fact that the same or other poisonous substances may occasion death slowly as well as suddenly, and even as slowly as the most chronic diseases, has not been sufficiently regarded, and the evidences connected with these effects have not been sufficiently, even if at all, investigated. There can be no doubt, — and several instances of the fact have come under my own observation in the course of practice, — of powerful medicines — of poisonous substances — having been too frequently or too long prescribed, in what was then considered full medicinal doses — now more justly estimated as dangerous quantities, and the consequences have been attributed to the progress of disease, to idiosyncrasy, or to other causes than the real. To those slow or chronic operations of poisons I shall advert when treating of individual poisons. It should not, however, be overlooked that disease of the heart and apoplexy may produce death as suddenly as a most virulent poison; and sometimes even more suddenly than any poison, with the exception of hydrocyanic acid. Death may occur almost instantly from organic disease of the heart, and but rarely within an hour from apoplexy, this acid being, perhaps, the only substance, unless in the

very rare instances above noticed, which occasions death in so short time; but, unless it be employed to commit murder, some traces of this poison are usually found at hand.

76. *B.* It may so happen, that the *duration* of the symptoms is the only, or the chief, medical diagnosis of poisoning. In this case there must be both difficulty and uncertainty; and an opinion should not be formed without further aids, although a careful review of all the known circumstances of the case, and of all the appearances about the person poisoned, may lead to very probable, and even correct inferences. In *acute poisoning*, or when life is rapidly destroyed, the diagnosis is generally more easy than in the *chronic*, or when death is occasioned by the consecutive effects of poison. But in many, even of the chronic cases, the cause of death is more or less manifest; as when a person who has swallowed a mineral acid, only partially recovers, and continues for many months afterwards to complain of stricture of the œsophagus, of which he ultimately dies. More frequently, however, it is most difficult to assign, with legal strictness, the ultimate result to the primary agent — to connect the fatal issue with the changes first produced by the poison, in cases of chronic poisoning; for numerous fortuitous influences or contingent agents may have intervened to reinforce, modify, aggravate, or otherwise affect, the earlier alterations, and thereby to subvert the regular succession of morbid phenomena from the first impression of the efficient cause until the fatal issue.

77. It is chiefly in a medical and strictly practical point of view, that the slow effects of poisons — that *chronic and slow poisoning* — becomes interesting, and even most important, — a form of poisoning altogether neglected by medical jurists, because rarely admitting of proof which may not be impugned. Corrosive sublimate, iodine, the arsenical solution, strychnine, digitalis, colchicum, and many other substances, may severally be given in doses so large, or for so long a time, either with a beneficial or with a criminal intention, as to destroy life after a more or less prolonged period. In these cases, the slow operation of the poison may occasion symptoms which may not be recognised as the effects of the medicine; or little or no effect may appear for a considerable period, until it suddenly breaks forth with such violence as to threaten, or even suddenly to destroy, the life of the person to whom the substance has been thus administered. But the effects may be both marked and characteristic of the poisonous substance prescribed, and yet be viewed as a part of the disease, and even identified with the disease which it was employed to remove. I hope, however, to direct a more especial attention to this matter in the sequel, than it has hitherto received.

78. ii. *The diagnosis of poisoning furnished by post mortem appearances*, has been very ably considered by the recent writers on medical jurisprudence. Mr. Taylor, whose accuracy is generally commendable, remarks that, "in relation to external appearances, there are none indicative of poisoning upon which we can safely rely. It was formerly supposed that the bodies of persons who were poisoned, putrified more rapidly than those of others who had died of natural disease; and evidence for, or against poisoning, was at one time drawn from the external appearance of the body. This is now known to be an error: the bodies of persons poisoned are not more rapidly decomposed, *cæteris paribus*, than those who have died a sudden or violent death from any other cause whatever." (p. 42.) To the above too general and positive inference, the following exceptions may be made: — 1st. That external marks or changes may be left on parts of the external surface, as the mouth, face, neck, hands, and near the outlets of the natural canals, which not only may indicate poisoning, but even the particular substance employed, as several of the corrosive and irritant poisons. 2d. I have had proofs furnished to more than one of the senses — namely, to sight, smell, taste, and touch, — that certain poisons, which I have classed under the head, *septic and disorganising*, actually produce a more rapid solution of the vital and physical cohesion of the tissues, or a more rapid progress of those *post mortem* changes either preceding or constituting putrefaction, than is usually met with, all the circumstances being otherwise the same. 3d. These senses have furnished me with evidence, that certain poisons will sometimes delay these changes, at least in some parts, and even about the outlets of mucous canals.

79. *A.* The several *internal*, and especially the *digestive viscera*, however, are the quarters in which the physician should endeavour to ascertain the fact of poisoning, in defect or in aid of other evidence. The mouth, throat, œsophagus, stomach, and intestinal canal, often furnish proofs of it; especially when acrid, corrosive, or irritant poisons have been employed, and although these proofs consist of the most severe lesions, and even of almost complete disorganisation, they are often insufficient of themselves to show the particular poison which has been swallowed, or even the action of any poison at all, without proof of its actual presence, or other additional evidence, so completely do these lesions assume, in many instances, the appearances consequent upon certain natural diseases. Much of the difficulty of distinguishing the effects of poison from the consequences of disease, is owing to the period which has elapsed from the time of death until that of making the examination; for, during that period, various *post mortem* alterations supervene, which obscure certain of the more intimate changes existing at the moment of, or just previously to dissolution. Much of the softening, of the corrosion, or of the dissolution of tissues, found twenty, twenty-four, or thirty-six hours after death, has taken place during that period; and even the changes observed in the colour of the blood and of the several membranes and tissues, have chiefly occurred subsequently to death. In cases where the poison is of a virulent, septic, or of a chemical nature, as the strong mineral acids, or the alkalies, and when these have not been entirely thrown off during the short period of life following their ingestion, it may reasonably be supposed that the portion remaining in contact with the tissues will produce some change of the structures, even after death — will affect the dead textures as we perceive such substances to act in some of the operations of domestic economy, and either hasten or delay the solution of vital or physical cohesion, or otherwise change the appearance and condition of the textures by combining more or less intimately

with them. In cases proving thus rapidly fatal, many of the poisons, especially the corrosive, the mineral, or saline, will be found either in the contents of the stomach or bowels, or in contact with the villous membrane of these viscera, or may even be detected by chemical analysis in the coats of the stomach, or even in the liver, or in the blood.

80. Death however may take place suddenly, and various morbid changes may be detected in the digestive canal, resembling, or even identical with, those produced by certain poisons; but unless the poison be detected in the matters vomited during life, or in the contents of the stomach, or of other parts of the canal, or in the blood, or in the substance of the viscera, the evidence furnished by these changes alone is altogether inconclusive; for similar changes may occur about the time of dissolution in cases of sudden death, or previously, or even subsequently to death, in various diseases, not necessarily causing the confinement of the patient until shortly before, or even not until a few hours before death. To these alterations I now more particularly advert.

81. *a. Redness* of the villous membrane of the stomach and intestines is generally caused by acrid, corrosive, or irritant substances; but it is not of itself a sign of poisoning upon which much dependence can be placed; for it may be inconsiderable where corrosion and disorganisation, caused by the most corrosive poisons, are the greatest; it usually characterises all inflammatory diseases of the digestive canal, and it may be very remarkable in cases of sudden death from accident, external injury, or other causes producing fatal shock, and independently of any existing disease, or of the ingestion of any irritating agent, as shown by Dr. Yelloly, and subsequently confirmed by numerous observers. It has been shown — 1st. That vascular congestion of the villous surface of the stomach, with a florid or dark-red hue, is not a proof of disease, and is not inconsistent with a state of health at the time of dissolution or shortly before it.—2d. That this state of redness and congestion found in some cases after death, is not even proof of gastritis. — 3d. That it is not alone an indication of the ingestion of a poison, or even of any irritant. — 4th. That the vascularity of the villous membrane is an injection of the venous capillaries and veins, the redness depending, in the instances observed the soonest after death, upon the arterial character of the blood congesting the venous capillaries; and, in those observed the latest after dissolution, upon the transudation of the colouring matter, or to the post mortem changes.

82. *b.* It is obvious that *redness*, as well as *congestion* of the villous membrane of the stomach, is liable to various changes during the time elapsing from death until examination. These changes are not only such as take place in ordinary circumstances during this time, both in the blood itself and in the tissues, but those also which are more especially caused by the morbid impression of the poison by the treatment resorted to, and by the action previously and subsequent to dissolution of the poison, upon the textures and upon the blood itself. When the redness is caused by poisons which not only irritate, but arrest more or less the putrefactive process, then it may be inferred to continue the longest after death. Mr. Taylor found it continue in the stomach and duodenum of the exhumed body of a man poisoned by arsenic, twenty-eight days after he had been interred.

83. *c. Ulceration* of the internal surface of the stomach is seldom observed in cases of poisoning, and never unless in those which have been manifested by well-marked symptoms previously to death. Ulceration is more frequently caused by arsenic than by any other poison, and this poison may even be found lodged in the edges of the ulcers, which present more generally the appearance of small circular abrasions of the villous membrane, which is more or less generally inflamed, or inflamed in the intervals between the ulcers, the inflammation sometimes extending to the duodenum and intestines. Ulceration from disease is not unusual (see Stomach—*Diseases of*); but, in these cases, the inflammation surrounds the ulcer, which often has tumified or thickened margins, whilst the ulcers produced by poisons present different appearances. The history of the case before death will generally enable the physician to determine to what cause the ulceration should be imputed. But *ulceration* should not be confounded with *corrosion*. Ulceration, although a morbid, is also a vital process, in which the secretions, the nutrition, and the absorption of the part, are disordered, consecutively of inflammation. Corrosion is a disorganisation of the intimate structure by a chemical action, which destroys the vital properties, and dissolves the vital cohesion of the textures; the corroding substance combining more or less with the tissues upon which it acts. Ulceration requires time to produce it; corrosion takes place instantaneously or almost immediately (see more fully on this subject, *Digestive Canal*, §§ 36. *et seq.*).

84. *d. Softening* of the inner surface of the digestive canal is a frequent effect of poisons, and is often found associated with corrosion, but is more diffused. Softening may be often viewed as merely a lesser grade of corrosion, especially when it extends to the several coats. It is generally most remarkable in the stomach, but, when it is limited to this organ, it cannot be considered as a consequence of poisons unless the inference be supported by further evidence, inasmuch as it is, when thus limited, most commonly the result of disease. When it is caused by poisons, corrosions of some parts often accompany it; and the softening is frequently extended from the fauces down the œsophagus, into the stomach and duodenum. This change should, however, never be considered as a result of poison, unless the poison be detected in matters which have been vomited, or in the contents of the digestive canal, or in the coats of this canal; for it is, even when thus extended, a very frequent result of disease, more especially in infants and children.

85. *e. Perforation* of the digestive canal is sometimes found, upon dissections, after the ingestion of poison, but it is also not unfrequently a consequence of disease. When caused by poison, it is commonly merely the extension of corrosion through all the coats of the viscus, and is most frequently found in the stomach, but it occurs in rare instances also in the duodenum and œsophagus. Perforation, like all other alterations of the digestive canal, although preceded by symptoms of poisoning, is not a proof of this act, unless the other proofs just noticed be also present. When it is a consequence of disease it

is produced by ulceration, which rarely or never occurs in cases of sudden or rapid poisoning, ulceration being the result of a morbid process requiring some time for its production: but this topic will be noticed in the sequel (§ 114.), and it is fully discussed in the Article DIGESTIVE CANAL.

86. *f.* The villous coat of the stomach may present other lesions which may furnish stronger evidence of poisoning than any of those already noticed. These are *corrugation, partial detachment, dark discolouration*, resembling *charring*, of the villous membrane; *ecchymosis*, or *small extravasations of dark coagulated blood*, underneath this membrane, which is raised into small *elevations*, and a *dark red or livid engorgement of the capillaries* and *veins*. These changes are most frequently found in the stomach; but they are sometimes seen, although in a less marked degree, in the duodenum, and even in other parts of the intestinal canal. Some degree of *induration* of the villous membrane of the stomach has been found in some cases after poisoning with sulphuric acid.

87. *g.* A *post mortem* change, which has been variously denominated, and especially as *spontaneous softening, pulpy degeneration*, and *spontaneous perforation* of the coats of the stomach, is met with, upon dissection, in rare instances. When this alteration is found in a patient who evinced no indications of gastric disease during life, and when it is unattended by any inflammatory appearances, the coats being gelatinous or pulpy, it may then be viewed as a consequence of the action of the gastric juices after death, as first stated by JOHN HUNTER, and rendered probable by the more recent researches of CARSWELL, BURNS, SHARPEY, and others. But a nearly similar change may be the result either of poisons or of disease. In the former case, which will be more particularly noticed hereafter, evidence of poison will generally be found either in the organ itself, in its contents, or in the matters vomited; and, in the latter, gastric disorder will have been manifested previously to dissolution, and the pulpy softening or perforation will be accompanied with some indications of inflammatory irritation, although in the aphthous, mesenteric, gastric, and gastro-enteric diseases of children, and more especially of infants, about the period of teething, weaning, and when improperly fed, softening, and even perforation of the stomach will occasionally be found, inflammatory appearances either not existing, or if they have existed, having altogether disappeared soon after death (see DIGESTIVE CANAL, §§ 35. 42.).

88. iii. The other *means of diagnosis*, so frequently adverted to above, namely, *the detection of the poison by chemical analysis and tests*, and the support which *moral circumstances* may afford the evidence, belong more especially to the medical jurist.—*A.* The *moral circumstances and appearances*, falling under the observation of the physician, should always be carefully remarked by him, not only as they may suggest to him the existence of poisoning, and thereby direct his attention to every point and aspect of the case, but also as they may be required from him in the judicial investigation, in which he will appear as a principal evidence. In every instance admitting of the least suspicion of poisoning, it is the duty of the medical man to ascertain, as fully as in his power, the whole range of symptoms or morbid phenomena; to observe assiduously the progress of the symptoms, from the moment they came under his notice until their termination in recovery or in death; to obtain information from those best able to furnish it, as to the circumstances connected with the origin and progress of the seizure; to trace their origin in obvious or imputed causes; to connect them, as far as may be done, with such causes as usually produce similar effects, and to determine, as far as possible, the presence of such causes in the case in question; and, if death take place, to note carefully all the changes observed in the dead body.

89. The importance of care and circumspection in these matters is shown by the fact that, although instances often occur in which the diagnosis of poisoning cannot be established, unless the poison be actually detected, to the satisfaction of the tribunals, still it may be sufficiently so to warrant the physician in the adoption of such measures as the symptoms will suggest for the recovery of the patient. And it should be recollected that, even in the event of death, there are many poisons which, owing to their nature, cannot be detected by any analysis or test, whilst there are others quite susceptible of analysis, which may be so changed or mixed with substances, alimentary and others, as to escape detection by chemical agents, either in the vomited matters, or in the contents of the viscera, or in the blood. In many such cases, there may be satisfactory proof of the persons having been poisoned, and, in some, conviction has actually followed, although the poison has not been detected in the dead body; the symptoms, the appearances after death, and the moral circumstances being sufficient to establish the fact. Moreover, due attention to every circumstance connected with the history and progress of the case, as insisted on above (§ 61—72.), will enable the physician to ascertain, even during the life of the patient, the particular poison employed, or, in default of this, the class of poisons to which it belongs, and to adopt a plan of treatment, which, if not successful, may nevertheless be appropriate to the symptoms and circumstances of the case. In the event of death, also, he will be more surely directed in his search for the substance which caused it, and his analysis and tests will be chiefly suggested and guided by the changes which the *post mortem* examination will disclose.

90. *B.* As soon as suspicions of poisoning are excited, or indications of it evinced, the *portions of the substance* which has produced the symptoms should be sought for on the persons of the poisoned and of the suspected individual; and if the substance cannot be found in the pure state, or in that of mixture with other substances, a chemical analysis should be instituted of the *several articles, fluid and consistent, of which the patient last partook;* and this inquiry should be full and satisfactory; for one portion of a dish may be poisoned and not the other,—the gravy and not the meat,—the sauce and not the fish,—the pie-crust and not the fruit, &c. &c. The salt may contain arsenic, and nothing else at table may contain this poison; and so on as respects various articles, and as regards several poisons. *The matters vomited*, and those *evacuated*

from the bowels, the former especially, should be chemically examined, or tested, as soon as possible, and during the life of the patient, whenever there is doubt as to the nature of the poison, in order that the treatment may be as appropriate as possible; but as tests, and a chemical laboratory, cannot be carried about with the physician, the physical appearances and characters of the matters thrown up should be carefully observed, in connection with the history of the case, and the existing symptoms, and the treatment directed accordingly. The vomited and evacuated matters ought, however, to be carefully preserved for chemical analysis, and those thrown off the stomach should be compared with *the matters found in the stomach and intestines after death.* These matters, with the digestive canal itself, and often with the collatitious and other viscera, should then be made the objects of chemical research, in order to satisfy the ends of justice. But this subject does not fall within the scope of this work.

91. X. Diagnosis of Poisoning during Disease. — This is a topic which has been slightly adverted to above (§§ 59, 60.) as one which has received but little attention from medical writers, and which hardly admits of satisfactory elucidation. — (*a.*) *Poisoning, either criminal, accidental, or suicidal, whilst the poisoned person is the subject of disease, or under medical treatment,* has occurred oftener than has been commonly suspected. Poisoning in these circumstances has certainly been attempted, and even accomplished, much more frequently than it has been detected, owing, — 1st. To the difficulty of determining the symptoms during life, and the changes after death, which belong respectively to disease and to poison: — 2nd. To the facility with which a poisonous substance may be added to, or substituted for, the patient's medicine, without suspicion being excited: — 3rd. To the symptoms caused by the poison being mistaken for the severity and progress of the disease; the previous duration of illness and other circumstances preventing any inquiry as to the cause of death; — and, 4thly, to the circumstance of the poison which has been employed not admitting of chemical detection, either from its nature, or from the state of admixture or combination, in which it has been taken. The difficulties in forming a correct diagnosis when a person is poisoned, in the course of disease, is heightened by the acuteness and severity of the malady; and when a poison has been administered, whose operation is such as closely to resemble, or as to appear, an aggravation of the symptoms of which the patient had complained, then the diagnosis can hardly be established, unless by the detection of poison in the matters vomited or in the evacuations from the bowels or kidneys, or in the body after death.

92. (*b.*) When a patient is suffering from diseases of *debility*, or is labouring under *exhaustion, anæmia*, the effects of *losses of blood*, and *chronic discharges*, poisoning is more readily effected, especially by depressing, paralysing and acro-sedative substances, than in other circumstances; and the effects, especially when the poison has been administered in successive doses, or at intervals, are not readily recognised or distinguished from the progress of the malady. In these states also of the patient's health, more especially when hæmorrhage or vascular depletions have preceded the ingestion of poison, absorption of it into the circulation more readily and more injuriously takes place, and the patient furnishes much less of vital resistance to its fatal operation.

93. (*c.*) I have had several reasons to believe, from the history of cases, &c., that poisoning has been both attempted and accomplished in the *puerperal states*, especially during the first two or three weeks after delivery; the operation of the poison having been mistaken for one or other of the diseases incidental to that state; and having been such as not to be distinguished from such disease, unless by the discovery of the poison, aided by various moral considerations.

94. (*d.*) *Acute diseases of the digestive canal and associated organs* may have existed for a longer or shorter time, and irritant, acro-sedative, or corrosive substances, may be administered accidentally, criminally, or from ignorance, which may so aggravate the attack as to render it dangerous or fatal. The heroic practice of medicine, so general and so much lauded, even within the range of my own observation and recollection, by those who concealed their ignorance by the swaggering boast of being "practical men," and that the literature and science of medicine were beneath their notice, as they were certainly beyond their reach, has furnished me with several proofs of actual poisoning having been committed by those self-sufficient and illiberal medicasters in the treatment of the diseases just mentioned. I have often seen, and had still more frequent occasion to remark, in medical writings, the recommendation of the most irritant purgatives, in excessive doses, in cases of enteritis, or in dysentery, with the intention of removing obstructions, or of expelling matters which had no existence, the substances prescribed either causing inflammation, or increasing that which already existed, and urging it on to a fatal issue. Irritant, corrosive, acro-sedative, or acro-narcotic substances, given either in poisonous quantities, or in so frequent doses as to become poisonous, in the course of these maladies, could not readily be recognised by their effects in these circumstances, nor even by chemical research, if the employment of them were concealed, and the mischievous tendency of their operation were not known.

95. (*e.*) Even in *chronic diseases* of the alimentary canal, especially *chronic dysentery*, or the *chronic diarrhœa* of warm climates, the exhibition of repeated doses of acrid purgatives, or of other medicines, with erroneous views of the nature of the case, and of the operation of the substance prescribed, has converted a complaint by no means serious into one which has become rapidly fatal. I have seen this practice in various places, and I could adduce numerous cases, in which it has been recorded in published works, or in the case-books of hospitals, furnishing useful, although fatal beacons, in navigating the shoals of medical practice.

96. (*f.*) Persons already the subjects of *diseases of the heart* or *of the lungs*, may be cut off by a criminal, or an incautious use of various sedative, acro-sedative, or acro-narcotic substances, especially when taken in too frequent doses, or continued for too long a time. Digitalis, tartar-emetic, colchicum, aconite, &c., may be given in these diseases so as to produce a fatal result, without the symptoms being suspected as being

caused by poison, or the result being viewed otherwise than as the *natural termination of the disease;* and the examination of the body after death, and chemical research, will fail of discovering the cause. From 1810 until 1830—a period abounding with medical cant, heroic and empirical practice, and disgusting dogmatism—certain substances came into very general use, from the abuse of which much mischief accrued, even within the sphere of my own observation; calomel, tartar-emetic, colchicum, digitalis, and more recently, iodine, were often given in such excessive doses, or continued in smaller quantities for so long a time, as to induce more serious diseases than those for the cure of which they were resorted to. The natural malady had the efforts of nature to aid them, if these efforts had been developed or duly directed; but the substances which were employed subverted vital energy, suppressed the natural efforts, produced morbid actions and organic lesions, which were mistaken for the course or turn of the primary malady; and, when they failed of causing death, occasioned a new or different form of disease. A patient had disease of the valves of the heart and dropsical effusion; large doses of infusion of digitalis were prescribed to act as a diuretic, and this effect was sometimes produced, and a certain amount of ease resulted; but quite as frequently the disease was arrested in a different way; the action of the heart was so much weakened by this treatment, as to become insufficient to overcome the obstacle to the circulation, and death was the consequence. Early in the present century, colchicum and tartar-emetic were lauded as anti-phlogistic remedies, as they certainly are, and were often brought in aid of the copious blood-lettings and various other empirical means unduly lauded by the ignorant pretenders and writers of the day. More than one writer of great but ephemeral popularity, extolled these substances, and prescribed them in excessive doses for the inflammatory and other diseases of the lungs and bronchi, both of children and adults; and I am confident that, in the former class of patients more especially, they were employed in such quantities, and for so long a time, as to prove fatal to more than they cured. The vital resistance, which so successfully opposes the progress of disease in most instances where there is no constitutional vice, was completely overthrown by these and similar means; and whilst vitality was either suppressed, impaired, or altogether destroyed by them, no opposition could be furnished to the unfavourable progress and consequences of the disease.

97. This subject might be pursued with reference to the diseases of other organs, and to various constitutional and febrile maladies; but I have, perhaps, stated what may be more than sufficient to rouse the attention of those who are not sufficiently aware of the importance which ought to be attached to it; well-educated, closely observing, and, in virtue of these, the only experienced practitioners, hardly require to be reminded of the several matters which these suggestions will undoubtedly recall to their recollection. Any further notice which this subject may require, will be taken of it in the discussion of the effects and treatment of individual poisons.

98. XI. The General Principles of Treatment.—What I have advanced will show the importance which should be attached to the operation of poisons, as forming the basis of rational measures of prevention and cure. Before I proceed to notice the injurious operation of particular poisons, and the treatment which each appears to require, I shall first offer a few remarks upon certain intentions and principles of treatment, which are more or less generally applicable, according to the mode of poisoning which has been resorted to. These brief remarks will refer to the *prevention*, to *the counteraction*, and to *the removal, of the effects of poisons.*

99. *A. Prevention of the action of poisons* may be attempted in certain circumstances, and may succeed either partially or completely. A poison may be swallowed, and, if the means be immediately resorted to, it may be removed before it has acted, or acted to a very injurious extent.—(*a.*) The means of removal are *emetics* and the *stomach-pump.* Of the former, but little may be said more than that they often fail to act, owing to the paralysis, or want of power of contracting, experienced by the parts concerned in the act of vomiting from the action of the poison which has been swallowed. It is therefore requisite to give powerful and warm emetics, as the sulphate of zinc, with capsicum, mustard, &c., according to the nature of the poison which has been taken; the intention being to excite the organic nervous influence at the same time that the discharge of the poison is procured, when this latter is of a sedative or narcotic kind.

100. (*b.*) The removal of the contents of the stomach by means of an apparatus, such as that now in general use, under the name of *stomach-pump*, although suggested by several persons long before the practicability of such means was actually put to the test, was first demonstrated, as being efficacious in cases of poisoning, by Messrs. Jukes and Scott in 1822, then medical practitioners in Westminster; and, in many instances, it is the most efficient and certain mode of removing the poison; but it is liable to certain objections. The perforations in the end of the tube may be obstructed, or the canal of the tube choked by the alimentary substances present in the stomach, and the withdrawal of the contents and of the poison will be thus delayed, or even prevented, if fluids be not injected into the stomach by this tube, in order to remove the obstruction and dilute the contents of the viscus. In cases, therefore, in which imperfectly dissolved poisons have been taken, or where a greater activity may be imparted to the poison by dilution or solution, the recourse to injections may be injurious, and the use of this apparatus may be less efficacious, in these circumstances, than an active emetic, which often empties not only the stomach, but the duodenum also, and increases the secretions of the villous surface and of the liver, thereby washing off the adhering portions of the poison, or preventing the imbibition and absorption of them. When, however, a judiciously prescribed emetic fails to act, or in cases in which an emetic may be inferred to be inactive, or in other doubtful circumstances, recourse to the stomach-pump should not be a moment delayed.

101. The removal of the poison is an indication which is not confined to cases in which the substance has been swallowed. It is equally important in instances of *external poisoning*, the ob-

ject being the prevention of the imbibition and absorption of the poison. There are two modes by which this intention may be accomplished.—1st. The application of a ligature above the part which has been inoculated with the poison, or between it and the trunk, so as to arrest its absorption and contaminating influence, and the diffusion of its impression by means of the nerves. This mode of prevention has been in use from the earliest ages, and is practised by most savage tribes. It is obvious, however, that this practice would be inefficacious if nothing further were attempted; and that the poison would act as soon as the ligature was removed. The great advantage of the ligature is to delay the operation of the poison until it can be either generally or partially removed by suction, or counteracted by local applications and internal remedies. Many substances are poisonous when applied to the skin, denuded of its cuticle or when inserted in a wound; and may yet come in contact with the mucous surface of the lips and mouth without risk, if there be no abrasion of the epithelium: and hence *suction* of a poisoned wound with the mouth, after the application of a ligature, where this can be applied, or suction without this antecedent in other circumstances, has been resorted to from the earliest ages, and is still practised in all uncivilised countries. The ligature, by arresting the return of blood, whilst arterial action increases the capillary injection, and even augments the discharge from the wounded surface, thereby favours the removal of the poison by suction, or by any other mode of exhausting the air over the part which may be adopted.

102. The intention of removing the poison introduced into a wound by exhausting the air over the wounded part was strenuously contended for by the late Sir D. Barry; and for this purpose he advised the application of *cupping-glasses;* and in situations where a ligature cannot be applied, cupping-glasses are the best means of sucking out the poison, or the blood and serum contaminated by the poison, from the part. But not only is absorption thus prevented, and the poison withdrawn, but the injurious impression made by the substance on the nerves of the part is prevented from extending, owing to the pressure produced by the margins of the glasses. We have certainly not improved in modern times upon the treatment of poisoned wounds recommended by the ancient Greeks, Romans, and Arabians, as Mr. Adams has fully shown. Nicander, Celsus, Dioscorides, Galen, and nearly all the Arabians, advise the application of a ligature, and then the extraction of the poison by sucking, by cupping instruments with scarifications, cauteries, escharotics, &c. They likewise prescribed remedies with the view of altering or counteracting the effects of the poison. If the poison was of a depressing kind or produced cold, they resorted to stimulating and heating medicines; if it was of an opposite nature they gave refrigerants; but they most frequently had recourse to articles of a heating nature, as they believed that the greatest part of poisons destroyed life by producing cold.

103. *B. The counteraction of the operation of the poison* is the next indication; and it often succeeds in respect of some, especially if attempted soon after the poison has been swallowed or applied; and the substances which thus counteract the poison have been called the *antidote*, or *counterpoison*. The antidotes of some poisons, especially of some mineral poisons, are well ascertained; and it is chiefly to chemical science that we are indebted for this knowledge; but we know but little of the means of counteracting many other poisons, especially those of the vegetable and animal kingdoms. Those antidotes whose actions have been ascertained are, 1st, those which form chemical combinations with the poison that are not injurious, as alkalies with acids, &c.; and, 2d, those substances which deprive acrid and corrosive poisons of their properties, or which form insoluble compounds with the poison. Certain antidotes are complete and efficient if administered sufficiently early, or before organic or vital changes of a dangerous nature have been produced; others are only partially efficacious, as ammonia in cases of poisoning with prussic acid.

104. Means which enable the system to resist the action of a poison may be ranked in this category. Those which prevent the absorption of the poison, as several of those which have been already noticed, or such as counteract the depressing influence of certain poisons, as the spices, cayenne-pepper, aromatics, spirituous liquors, &c., in cases of animal or fish poisons, are often more or less efficacious. When poisons are taken in large quantities, the œconomy, especially the nervous system, sustains more or less of shock; and, if appropriate means be immediately used to aid it in rallying, a greater degree of vital resistance will be opposed to the progressive advance of the effects. From these remarks, it may be inferred, that, in our endeavours to counteract the operation of a poison, we should attend to the following cautions,—1st. To avoid all means which may render the poison more soluble, or which may dissolve it, or add otherwise to its activity; thus we should not give wine or vinegar soon after a large quantity of opium has been taken:—2d. To avoid such measures as may promote the absorption of the poison into the circulation, as bloodletting;—3d. In cases of poisoning by depressing agents and narcotics, or such as destroy nervous power and irritability, medicines, emetics or others, which act in a somewhat similar manner, as tartar emetic, ipecacuanha, &c. should not be exhibited.—4th. That the shock sustained by the ingestion of virulent poisons should be counteracted by energetic means, of a stimulating and restorative kind, administered according to the peculiarities of the case; and that vomitings, however frequent, should not prevent the exhibition of these, in cases of narcotic, depressing, and animal poisons, or even in others, unless the vomitings proceed from the action of corrosive and very acrid poisons.

105. *C. The removal of the progressive effects of the poison, and opposing the tendency to death*, remain to be put in practice either when the first and second intentions cannot be attempted, owing to the time which has elapsed from the exhibition of the poison, or after one or both have failed. To be successful in these circumstances, the physician should be well acquainted with the physiological action of poisons, and with the phenomena by which this action, in its progressive phases, are indicated—with the symptoms and progress of the mischief, and with the pathological states produced by individual poisons, and more immediately inducing death;—he should be acquainted

with the operation of active substances on the œconomy, both in medicinal and in poisonous doses, in order that he may duly recognise the nature and effects of the latter doses, and may apply the former to the removal of these effects, according to rational indications. That a knowledge of the physiological and pathological actions conjoined, consequent upon the exhibition of a poison, and of the ultimate changes of which death is the result, is of the utmost importance to the physician, is evinced by the fact, that it is this very knowledge which, in extreme cases, and after other indications and means have failed, enables him to devise further measures which may still be successful. Thus, if it be ascertained that the poison, in the advanced course of its effects, has produced paralysis of the muscles of respiration, or spasm or closure of the glottis, means directed to the continuance of respiration, or the production of artificial respiration, may yet save the patient. This fact has been demonstrated on several occasions, and other analogous illustrations of the principle will appear in the sequel. It is obvious that nothing further can be advanced with due precision under this head, until the effects of the individual poisons are considered.

106. XII. CLASSIFICATION OF POISONS.— The *effects*, and the ultimate *results of poisons* being so diversified and complex—many producing nearly similar or variously modified effects, and the same substance evincing very different phenomena in different persons and circumstances, the effects of a single poison being thus neither constant, nor always distinctly developed, — it follows that a satisfactory *classification* of them can hardly be expected. Indeed, all attempts at classification must be conventional; for if we endeavour to arrange them conformably with their physiological action, or according to the systems or tissues on which each appears especially to act, we shall find, as must be manifest from what I have already advanced, that many of them act upon, or through the media of, two or more systems, and upon several functions; and that the substance which affects one person, or one system, in a more or less definite manner, operates differently in others, the effects varying with the circumstances shown to modify the operation of poisons (§§ 51. *et seq.*). Although we should have regard to the succession of changes consequent upon the ingestion of a poison until the ultimate results appear, still we have here comparatively little concern with those which follow the employment of the same substance in small or medicinal doses. It is the deleterious action which should be observed, and the best means of counteracting that operation, and of averting or removing its usual effects. The question is not whether or no opium, morphia, or hydrocyanic acid, &c. be stimulants, sedatives, or narcotics, or entitled to other appellations, which have been given them; but it is practically, to which of these properties, or to what other property, are the injurious effects chiefly owing, and by what successive changes are these ultimate effects produced? It is principally the progressing and advanced alterations of vital function or of structural lesion that are to be arrested and remedied, and it becomes most requisite that we should not only know the nature of these changes, their whole extent, and their probable issue, but also that we should arrange those substances which operate in similar or nearly similar modes, and induce similar results, in order that the treatment which may be found successful against one poison belonging to this category may be advantageously extended to the others. That an arrangement of poisons should be adopted according to this principle — with reference to the operation and effects of these agents, and that the classification may thus be made practically useful in a therapeutical point of view, is shown by the extension by the author of the affusion of cold water on the head and neck to cases of poisoning by various narcotic and sedative poisons. The cold affusion had been employed for ages for intoxication and insensibility caused by inebriating liquors; and the author, having repeatedly seen it thus employed with success, had recourse to it in 1821, in a case of poisoning by *opium*, published in 1822 in the *London Medical Repository* (vol. xviii. p. 29.), and in 1825 he recommended, in the work now named (vol. xxv. p. 40.), this practice in cases of poisoning with *prussic acid*, and with other poisons belonging to the same classes as those just named; and this treatment has been found most efficacious in states of vital depression and insensibility produced by narcotics and sedatives generally. The propriety, therefore, of adopting a classification based upon the most prominent operation and effects of individual poisons, as being the most practically useful, must be apparent. In venturing to recommend an arrangement different from that which has been suggested by Dr. PARIS, and from that advised by FODÉRÉ, and adopted, with certain modifications, by ORFILA, and still further modified by CHRISTISON, DEVERGIE, BECK, TAYLOR, and several other recent writers *, I have been influenced chiefly by the firm conviction, entertained without any doubt from the first enunciation of these classifications, that they were inadequate and inaccurate; inasmuch as the principal operation and effects produced by several virulent poisons had no place given them, or did not fall within the scope of the arrangement, and as various substances were classed under heads to which they could not with due accuracy be assigned, and were hence viewed as productive of effects of which they were altogether innocent, whilst those which they did actually produce were not at all, or not sufficiently recognised. Thus prussic acid and the prussiates were arranged in the class narcotics, and numerous substances were classed as irritants, whose operation in this respect was the least considerable of the several effects produced

* *The arrangement proposed by Professor* FODÉRÉ was as follows: —

i. Septic poisons.—ii. Narcotic or stupefying poisons. iii. Narcotico-acrid. — iv. Acrid or rubefacient. — v. Corrosive or escharotic.—vi. Astringent poisons.

ORFILA at first adopted, with slight modifications, the above arrangement, but afterwards reduced the classes to the following: —

i. Irritants. — ii. Narcotics. — iii. Narcotico-acrids, and iv. Septic poisons.

CHRISTISON, BECK, and TAYLOR have adopted this arrangement of M. ORFILA, discarding most undeservedly the class septic poisons.

The classification suggested by Dr. PARIS is based upon the presumed mode in which individual poisons act.

i. Poisons which act through the medium of the nerves, without being absorbed, and without exciting local inflammation. — ii. Those which enter the circulation, and act through that medium with different degrees of force, on the heart, brain, and alimentary canal. —iii. Those which act locally on the mucous membrane of the stomach, exciting a high degree of inflammation

by them. From the observations made above as to the *general and special operation of poisons on the animal œconomy* (§§ 28. 34. *et seq.*), the following classification is suggested, as corollaries: — i. *Acrid and corrosive poisons.* — ii. *Depressing and paralysing, or sedative poisons.* — iii. *Exciting and astringing.* — iv. *Exciting and exhausting poisons.* — v. *Irritating and depressing or paralysing — acro-sedative poisons.* — vi. *Irritating and alterative — acro-alterative poisons.* — vii. *Narcotising or stupifying poisons.* — viii. *Narcotising and irritating — narcotico-acrid poisons.* — ix. *Septic or disorganising poisons — dissolving the vital cohesion of tissues.*

107. As to these classes I may remark, that the operation of the substances arranged under the *first*, is more or less strictly local, when the quantity of either is large, or when the poison is concentrated; but that when certain of these substances are employed in small doses, or in weak solutions, they will then act in such a manner as may warrant the arrangement of them under different heads. The *third* and *fourth classes* might have been comprised in one and divided into *two orders*, but I considered it better to have too many classes, than to subdivide them. I may offer the same remark as to the *fifth* and *sixth classes*, but for practical purposes I preferred the arrangement as it stands.

108. XIII. Of the special Effects and Treatment of Poisons. — Class. I. Acrid and Corrosive Poisons. — *The irritant poisons of several recent authors.* The numerous substances arranged by recent writers, as *irritants*, comprise many which I have here denominated and expressed more strictly in accordance with their real operation. It surely cannot be admitted, moreover, that the substances which I am about to consider under this class destroy life by *merely irritating* the surface to which they are applied. Is there no local lesion produced beyond irritation? That the local action amounts to something far beyond irritation will be admitted by every one who is in the habit of observing closely, or of attaching precise meanings to words. The want of precision is here chiefly owing to the circumstance of these writers having classed under the same kind those substances which are most acrid and corrosive, and most limited in their sphere of action, with others which are really but slightly irritant, and which are destructive of life by producing other and very different effects from irritation. This will become more apparent in the sequel.

109. i. Of the Symptoms and Diagnosis of poisoning by acrid and corrosive Substances. — The symptoms vary with the degree of solubility, the concentration of the solution, and with the nature and admixture of the substance. When the poison is very soluble or is fluid, and very corrosive, the mouth and tongue evince most severe symptoms; there are burning and pricking or darting pain, redness, swelling with exudation of lymph, or corrosion and destruction of the mucous membrane or epithelium, and an acrid and burning sensation in the mouth and fauces. These sensations and alterations extend more or less to the pharynx, and along the œsophagus; and the patient is incapable of swallowing, or if he attempt to swallow the matters are spasmodically rejected. When the poison is fluid, as a mineral acid or an alkali, the burning pain and change of structure rapidly produced in the mouth, throat, and œsophagus, and all the symptoms referable to those parts, precede disorder of the stomach; and in some instances, the poison is not conveyed further than the œsophagus, owing to its violent action on the pharynx, and the spastic contraction of this part and of the upper part of the gullet. When, however, owing to the peculiarities of the case, or to the less solubility or state of admixture of the poison, the mouth and throat are but little or slightly affected, the stomach then evinces the chief disturbance. Pain, sickness, or nausea, burning heat, and vomiting, are rapidly produced. In some instances the burning pain, and acrid constriction, extend from the mouth or pharynx, along the œsophagus to the stomach. The pain and vomiting follow immediately upon the passage of the poison into this viscus. The rejected matters consist at first of the contents of the stomach with more or less of the poison, and subsequently of mucus and serum, often streaked with blood, and mixed with bile, but frequently also altered by a portion of the poison being conjoined with them. Owing to the rapid rejection of its contents, and of the greater portion of the poison, the stomach may be chiefly or almost alone affected. This is the case, however, in comparatively rare occasions, for some of the poison most commonly passes into the duodenum, and often also into the small intestines, especially when the poison, as arsenic, is not very soluble, or is taken in an undissolved state; and in these circumstances some time may elapse between the ingestion of it and the occurrence of vomiting. But when this or any other poison is taken in such quantity and state as to produce a corrosive effect, the action on the stomach is manifested very soon after its ingestion; and is attended by more or less tenderness, tension, and soreness in the upper regions of the abdomen, and by a terrified or an anxious expression of countenance.

110. When an acrid or corrosive poison reaches the intestines — which may not occur when the poison is very active, and the lesion of parts above the pylorus is intense, and the shock to the vital endowment consequently great — most acute burning or lacerating pains more or less constant, but aggravated at intervals, are felt around the umbilicus or over the whole abdomen, and are attended by a sensation of twisting, sometimes by a feeling as if the intestines were drawn against the spine, and often by a distressing aching in the loins extending to the epigastrum. The abdomen is always tense and tender, but at first there is no swelling, but rather a retraction of the parietes; but distension from flatus generally supervenes. Purging is frequently present with tenesmus, and sometimes with excoriation of the anus. After feculent matters are passed the stools are mucous, watery, or serous, streaked with blood, or contain a considerable quantity of blood. The affection of the bowels may be the prominent effect, the stomach being comparatively but little disturbed, but more frequently the whole alimentary canal is affected, and vomiting and purging, with distressing pain and vital depression, are present at the same time.

111. As the operation of the poison proceeds painful and scanty micturition occurs; hiccup sooner or later appears, and becomes distressing; the pulse is rapid, small and weak; the strength and spirits are prostrated, the features sunk, the surface

is covered with clammy cold sweats, the extremities are cold and shrunk, and the voice fails In cases where the poison excoriates the fauces, pharynx, or upper portion of the gullet during deglutition, the irritation often extends more or less to the epiglottis and glottis, producing wheezing or difficult respiration, hoarseness, or spasm of the glottis, and in rarer instances even death by asphyxia. It will appear from this that this class of poisons produce effects which may readily be mistaken for several of the diseases mentioned above (§ 68.); and to the diagnosis between these effects and those diseases I shall next briefly advert.

112. *A.* CERTAIN LESIONS OF THE STOMACH are attended by symptoms, especially near a fatal termination, very closely resembling those produced by corrosive substances.—(*a.*) *Rupture and partial laceration of the stomach* may follow sooner or later after a full meal, and owing to the circumstance, as well as to the attendant phenomena, occasion suspicions of poisoning, which, however, an examination of the body after death readily disproves. Instances have occurred of persons who have eaten too largely, either after long abstinence, or after having suffered from dyspeptic disorder, and who have been seized with violent but ineffectual attempts to vomit, pain in the stomach, sudden collapse, and death in a short time, preceded by abdominal tumefaction and tenderness. On dissection, laceration of the coats of the viscus and the passage of the alimentary matters into the peritoneal cavity have been found. In the case, described by M. LALLEMAND, which occurred after long privation and dyspeptic symptoms, the patient exclaimed that she felt her stomach tearing itself open. The laceration was five inches long; the coats were not diseased, but the pylorus was indurated. Dr. CHRISTISON refers to two cases, in which the laceration appeared to have been caused by the accumulation of gases arising from depraved digestion. In these, as well as in cases where the distending matters have been more consistent, the laceration has been owing as much to weakened vital cohesion of the coats of the stomach as to the amount of the distending matters. Instances of rupture of the stomach have been recorded by Dr. ROBERTS and Mr. WEEKS; and upon dissection no sufficient cause of the occurrence was detected. It may be therefore inferred that flatulent distension of the stomach having occurred, as it usually does, when the vital tone and cohesion of the organ are most impaired, spasmodic reaction or contraction of the parietes had taken place, during which laceration had been the result. The rupture may be only *partial;* as in the case related by Mr. CHEVALIER, where the symptoms of corrosive poisoning occurred after a very full meal, attended by vomitings of blood towards its close. Upon examination after death, the inner coat of the stomach was torn in several places, and that of the duodenum was also extensively lacerated.

113. (*b.*) *Rupture of the coats of the stomach at the bottom of a chronic ulcer, or perforation of the stomach,* may be attended by similar phenomena to those caused by corrosive poisons. 1st. The ulceration may have existed and been attended by paroxysms of pain, or of retchings, and when it had proceeded as far as the peritoneal coat, or partially through the muscular coats, the distension of a full meal, or of flatus, in connection with efforts at vomiting, has produced *rupture of the tissue forming the bottom of the ulcer,* and the escape of the contents of the viscus into the peritoneal cavity,—2d. The ulceration may have gone on to *perforation* without any evidence of rupture or laceration. Perforation may, however, take place without the escape of the contents of the stomach into the peritoneal cavity; the peritoneal surface around the perforation having become agglutinated to an adjoining viscus, as in two cases which occurred in my practice.

114. *Perforations* of the stomach are described in the Articles DIGESTIVE CANAL (§§ 36—43.) and STOMACH; it is therefore only necessary to state at this place, that the symptoms attending them, in their course, and towards their fatal termination, should be carefully distinguished from poisoning; for the diagnosis is not always easy. Perforation occurs most frequently in females between 16 or 17 years, and 25 years of age — especially in the scrofulous diathesis, in the sedentary, and in connection with disordered catamenia, and in delicate or weak constitutions. The severe symptoms, especially sudden and acute pains, retchings, or vomitings, anxiety, vital depression, &c., generally occur after eating or drinking, and especially after a full meal; and, if perforation has actually taken place, there is always vital shock or collapse, accompanied by the extension of pain and tenderness, with more or less tumefaction or tension, over the whole abdomen. In these cases, the advanced symptoms and death are results of the peritonitis caused by the matters which have escaped into the peritoneal cavity; and the vomiting is often slight, consisting chiefly or altogether of articles recently taken. There is seldom purging, which frequently accompanies poisoning, although constipation is not so generally observed as stated by some writers. The appearances found after death, and a careful examination of the articles partaken of, and of the matters thrown up, are the chief means of diagnosis.

115. *B.* LESIONS OF THE INTESTINES AND OF ALLIED PARTS may be attended by symptoms resembling the action of corrosive poisons — (*a.*) The *duodenum,* as well as the stomach, may be ruptured, independently of external violence, without any other apparent cause than over distension, and retchings whilst in this state. Dr. CHRISTISON refers to an instance of a man, who was seized after dinner, when mentally excited, with violent pain in the stomach, vomiting, and failing pulse, soon followed by death. The mucous surface of the duodenum was much inflamed; and, four inches and a half from the pylorus, a laceration extending through a third of the circumference of the bowel was observed.

116. (*b.*) The *passage of gall-stones,* and the violent pain, vomitings, and vital depression accompanying this affection may suggest suspicions of poison; but the slowness of the pulse, or the absence of febrile symptoms, the tolerance of pressure in the region of the stomach, or the presence of jaundice, will, in some instances, indicate the nature of the case. Still these symptoms cannot be relied upon, and they may not be present; other circumstances duly investigated furnishing the chief sources of diagnosis. Besides, gall-stones may produce severe irritation, with abdominal or epigastric tenderness and tension, as well as pain and vomiting; and when these occur soon after

the ingestion of food or drink, they furnish sufficient reasons for careful observation and examination on the part of the physician. An elderly lady, after slight jaundice, was suddenly seized with violent pain in the stomach, vomitings recurring in frequent fits, followed, after some hours, by most excruciating pains, incessant retchings, coldness of the skin and failure of the pulse. In seven hours from the fresh accession of suffering she expired. The hepatic duct was found torn across, a gall-stone at the opening of the cystic duct, and three pounds of blood and bile in the peritoneal cavity, which was inflamed in different parts. (*Journ. des Prog. des Sc. Med.* t. xiv. p. 245.).

117. (*c.*) *The sudden flow of acrid bile into the duodenum*, especially during warm seasons, after this secretion had accumulated in the gall-bladder and ducts, is not infrequently the cause of symptoms which have been mistaken for the ingestion of acrid poisons. This is most likely to occur where a person, who is subject to this biliary accumulation, takes some article which disagrees with him, or some chologogue purgative. I have met with two or three instances of persons who complained of the symptoms I have described as diagnostic of biliary accumulation or obstruction (see Gall-bladder, §§ 18. *et seq.*, and Liver, §§ 48. *et seq.*, and §§ 78. *et seq.*), and for whom a moderate purgative dose was ordered. But the medicine having removed the obstruction, the passage of acrid bile into the duodenum occasioned symptoms of so violent a nature — retchings and vomitings, diarrhœa, pains in the stomach and throughout the abdomen, &c. — as to suggest suspicions of an acrid or corrosive poison having been given, instead of the medicine prescribed. The bile which passed into the duodenum in these instances, possessed sufficient acridity to occasion many of the symptoms of poisoning.

118. (*d.*) *Bilious cholera* may likewise be mistaken for the effects of acrid or corrosive poisons; indeed it is most difficult in many cases to distinguish between them, and still more difficult to point out any means of diagnosis which can be depended upon. Much will depend upon the acumen of the physician, and the view he takes of the history of the case, and all the circumstances attending it. The nature of the ingesta, and the state of the matters ejected, should be carefully inquired into; and if heat, acridity, or darting pains be felt in the mouth, pharynx, or œsophagus, their occurrence *before* or *after* the vomiting ought to be ascertained, and the mouth and pharynx should be examined. These symptoms seldom even attend, and never precede bilious cholera; whilst they very frequently, indeed most commonly, precede poisoning with acrid or corrosive substances. Blood is never seen in the matters thrown from the stomach in cholera, whereas it is frequently seen in these matters when the vomiting has been caused by these poisons. Bilious cholera, or any state of cholera observed sporadically in this country, even when excited by indigestible articles of diet, rarely terminates fatally within 48 hours, and indeed very seldom thus terminates even in a much longer period, — whereas the effects of corrosive poisons are much more rapidly fatal.

119. (*e.*) *Pestilential cholera* is also liable to be mistaken for poisoning with acrid substances; but the same circumstances as have been just noticed serve to distinguish between them, with the exception of the rapid termination of the former, which is frequently equally rapid with the latter. But the prevalence, and infectious nature of this pestilence, the general symptoms, the state of the surface and of the extremities, and the appearances and odour of the fluids thrown off during the progress of the malady, will readily distinguish it from poisoning, especially if the physician have seen cases of it on any former occasion.

120. (*f.*) *Inflammation of the stomach, or of the intestines, or of the peritoneum*, may be confounded with poisoning with corrosive substances, the first of these more especially. Acute gastritis, uncomplicated with inflammation of an adjoining viscus, seldom occurs primarily in temperate climates, and not very frequently in warm countries, unless as a consequence of the excessive use of spirituous liquors, or other stimulants. But it does occur more frequently both in England and Scotland than Dr. Christison has inferred from the statements of M. Louis. Acute gastritis sometimes is produced primarily — and formerly it was produced more frequently — by drinking excessively of spirituous liquors, and the severity of the symptoms were occasionally such as to equal the violence of those occasioned by acrid poisons; but the history of the case, the symptoms of intoxication, the odour and appearances of the matters rejected, &c., will sufficiently point out the nature of the affection. It must be admitted that the possibility of acute gastritis being produced by natural causes is a question of great interest and importance to the practical physician. Dr. Christison remarks, that the possible occurrence of this disease, independently of poison, is the only obstacle in the way of a decision in favour of poisoning when, in cases characterised by signs of violent irritation during life and early death, bright redness, ulcers, and black granular, warty extravasation are found in the internal surface of the stomach; and in regard to their effects he adds, that they can very rarely indeed all arise from natural causes, or indeed from any other cause than poison. Admitting the truth of this, I may state, that violent gastritic symptoms, death after some hours, with vascular injection, redness of the inner surface of the stomach, and numerous ecchymoses, have occurred, without sufficient evidence of poisoning, unless, in some instances, the excessive use of spirituous liquors be considered as such, and to which it is strictly entitled. When ulcers, excoriations, abrasions, or corrosions of the inner surface of the viscus are found, in cases which have terminated rapidly, and in connection with bright redness, ecchymosis, &c., there can be little doubt of the ingestion of an acrid or corrosive poison, although it may have escaped detection. An important sign in cases of gastritis, as well as of cholera, is the absence of excessive heat or burning in the throat, or of painful and difficult deglutition; which very frequently precede the vomiting in cases of poisoning by acrid substances, and which seldom attends and never precedes the vomiting from spontaneous gastritis or enteritis.

121. (*g.*) *Acute enteritis, gastro-enteritis*, or *peritonitis*, may, in some instances, give rise to suspicions of poisoning; and the physician will consequently be induced to inquire, as in the diseases already noticed, — 1st, as to the time at which vomiting

appeared after a meal, or after the ingestion of any article whatever. — 2d. As to whether the disease was ushered in by chills or rigors, or is attended by febrile re-action or commotion.—3d. As to the state of the bowels, of the evacuations, and of the matters thrown off the stomach. — 4th. As to the symptoms referable to the mouth, throat, and œsophagus. — 5th. As to the presence or absence of diarrhœa, and of excoriations at the anus;—and 6th. into all the circumstances connected with the history and existing state of the case. The causes assigned for the attack; the relations subsisting between these causes, and the supervention of chills or rigors, of vomitings, and of consecutive febrile re-action; the existence of constipation, and the absence of lancinating pains or burning sensations in the mouth, throat, and œsophagus at the commencement, and of painful and violent purging and excoriations of the anus at an advanced period, with other particulars connected with the history of the case, will distinguish most instances of spontaneous inflammation of the digestive organs and of the peritoneum from poisoning with acrid or corrosive substances.

122. (*h.*) *Perforation of the intestines*, as well as perforation of the stomach, always terminates fatally; and when it is attended by symptoms simulating those which are caused by acrid poisons, an examination after death will show the nature of the case. (See DIGESTIVE CANAL, § 40. *et seq.* and INTESTINES, §§ 80, 81.)

123. (*i.*) *Colic, iliac passion, and strangulated hernia*, may severally be mistaken for poisoning with corrosive substances, especially when they are attended by violent retchings or vomiting; or poisoning by these substances may be mistaken for these. *Internal strangulation, intus-susception of a portion of intestine*, and the existence of *intestinal concretions*, or other causes of obstruction, may likewise occasion symptoms closely resembling poisoning, especially the vomitings, pain, anxiety, and vital exhaustion attending them. But the history of the case, the obstinate constipation, the appearances and odour of the matters thrown off the stomach; the sensations of the patient as to the seat of obstruction and pain; and the lesions found after death, with the other circumstances already adverted to, will serve to distinguish these maladies from the effects of poisons.

124. Having taken a view of the features distinguishing certain natural diseases from the effects of corrosive or acrid poisons, I should now proceed to describe the *structural lesions* produced by these latter; but as these lesions differ very remarkably from each other, according to the particular substance causing them, I shall briefly notice them in connection with the especial consideration of the several substances acting chiefly by their corrosive or acrid properties, or by the *local changes* produced in the viscera, with which they are brought in contact, and for facility of reference, I shall treat of them in alphabetical order.

125. i. ACIDS.—*A.* ACETIC ACID, in its concentrated state, *acts* chiefly as a corrosive agent. Although, in its various forms, it is in daily use, it is rarely the cause of death, even when swallowed by mistake in considerable quantity. Its injurious effects have been described by ORFILA, BARRUEL, SCHUBARTH, and HÉBRÉART.

126. *a.* According to the last-named experimenter, a small quantity of acetic acid dropped into the *windpipe* occasions difficult and hissing respiration, croupy cough, and death in two or three days, the surface of the larynx and trachea being covered with a false membrane similar to that found after croup.

127. *b.* The concentrated acid, *applied externally*, acts as a corrosive agent on the tissues. In this state it operates chiefly locally, dissolving the albumen, fibrine, and gelatine; and is but slightly absorbed. It coagulates, and renders dark the blood in the capillaries.

128. *c.* If *injected into the veins* in a strong or concentrated state, or if the quantity be considerable, it changes the physical appearances of the blood, and alters the colour and condition of the red globules. According to Dr. POMMER, when it is dilute, or about the strength of the distilled vinegar in common use, several ounces of it may be injected into the blood without material mischief; but the more recent experiments of ORFILA throw much doubt upon this inference.

129. *d.* Acetic acid *taken into the stomach* in large quantity, but more especially in a very concentrated state, and if the stomach be empty, produces agonising pain, and a sensation of burning in the stomach, with anxiety at the epigastrium, and convulsions, and death after a few hours. In this concentrated state it acts chiefly locally, and is not absorbed in an appreciable degree. It affects violently the nerves of the organ, the affection being progagated to the large visceral ganglia; and it coagulates the blood in the capillary vessels of the organ, and arrests the circulation through them, occasioning also a vital shock. In dilute states and in frequent doses, this acid acts chiefly through the medium of the blood, lowering nervous energy, and vascular action, as will be shown hereafter. (See next CLASS.)

130. *e.* The *appearances after death* by the concentrated acetic acid, are lividity of the integuments of depending parts of the body; a brownish and leathery appearance of the mouth, fauces, and pharynx, and a similar change extending down the œsophagus to the stomach or to parts of this viscus. The inner surface of the œsophagus presents large patches of a dark-brown hue, with reticulations of injected capillary vessels. The stomach, in some places, has a greyish tint, interspersed with dark-reddish spots, with numerous ecchymoses, and several large black elevations consisting chiefly of coagulated blood in the sub-villous cellular tissue. A livid or black hue of the fundus or near the pylorus; a thick, dark pulpy matter adhering to parts of the internal surface of the organ; and the presence of more or less of the acid in this viscus or in the intestines, have also been observed. The intestines are not materially altered.

131. *f. Treatment.* Draughts containing calcined magnesia, or the alkaline or magnesian carbonates; the cautious use of the stomach-pump, as the villous surface of the œsophagus and stomach is readily injured by mechanical agents after corrosive poisons; the injection of magnesian or alkaline solutions, and the removal of the contents of the viscus soon afterwards, by this apparatus, are the measures more immediately required. Subsequently, albuminous or demulcent fluids, mild broths, arrow-root, sago, and various mucilaginous and farinaceous articles of diet, may be given in small quantities, and frequently.

132. *B.* THE HYDROCHLORIC, THE NITRIC

and the Sulphuric.—As these acids, usually denominated the *mineral acids*, when used in poisonous states and quantities, produce similar phenomena, and require the same means for the counteraction and removal of their effects, I shall consider them under the same head, and, in some respects, in connection. — *Hydrochloric acid — muriatic acid — spirit of salt* — is not infrequently employed as a poison; but the *nitric acid — aqua-fortis;* and the *sulphuric acid — vitriolic acid — vitriol — oil of vitriol*, are not infrequently resorted to, for purposes of murder or suicide, or of external injury short of murder. Either of these acids may be swallowed by mistake, or be employed in various criminal ways. Tartra adduces an instance of a female who, having been intoxicated, was poisoned by nitric acid, which was mixed with wine and poured down her throat. A woman was convicted of murdering her husband by pouring sulphuric acid down his throat while he lay asleep with his mouth open; and several instances have occurred of the same acid having been given in poisonous doses, in place of the medicines which had been prescribed. The mineral acids, especially the sulphuric, have likewise been employed, by abandoned persons, to poison their own infants. But they are much more frequently resorted to as a means of suicide. They have also been employed, from motives of revenge or of dislike, to disfigure the countenance or person; the concentrated acid being squirted or thrown over exposed parts of the body. Mr. Taylor states that the external application of nitric acid has been a criminal cause of death on many occasions. In one instance this acid was poured into the ear of a person while sleeping, and it led to the slow destruction of life.

133. *a. The symptoms* occasioned by the mineral acids, *when swallowed in a concentrated form*, are of the most violent description, but the alterations produced by them on the organization are chiefly local and structural. Dr. Christison justly remarks, that they afford the purest examples of true corrosive poisons, their poisonous effects depending entirely on the organic injury they occasion in the textures to which they are applied; and that it is of use to set out, in the investigation of the effects of poisons, by determining the phenomena presented under such circumstances. I shall have more immediately to describe the violent symptoms and the severe structural change produced by these substances before a fatal result ensues; and in the sequel to show the much less violent phenomena, and the very slight local signs which other poisons hitherto classed with these leave of their operation, and yet prove more rapidly and certainly fatal than they; and few will fail of being struck by discovering the great extent of lesion the animal frame will sometimes endure from the former—the most violent of all corrosive substances, and yet recover; and the very slight alterations locally produced by these other poisons, whose operation is so rapidly fatal. These circumstances will of themselves prove sufficient to warrant an arrangement in which substances differing so very materially in their local and constitutional effects as those alluded to should not be classed, as they hitherto have been, under the same head, but should be arranged under different classes, according to their most prominent mode of operation and effects.

134. *b.* The mineral acids may produce fatal effects when *applied externally*, when *injected into the veins or into mucous canals*, when *inhaled in the form of fumes*, and when *swallowed*. When *applied externally* in a concentrated form, or even in a state of strong dilution, they irritate, corrode, or inflame the skin. The nitric, or rather the strong nitrous or fuming nitrous acid, produces these effects most severely; but the sulphuric and hydrochloric act almost as violently as it. In the stronger states these acids chiefly act locally and disorganize the tissues, the coagulation of the blood in the capillaries and the destruction of the organization on which they act generally preventing their imbibition and absorption.

135. *c.* When *injected into the veins*, even in a state of considerable dilution, they coagulate the blood, and thus destroy life; but when the dilution is still greater, or such as to allow of the circulation and presence of either of these acids in the vessels of the heart, ganglia, or brain, before coagulation even partially takes place, it may reasonably be inferred, that the vital manifestations of these organs will be thereby rapidly subverted.

136. *d. If the fumes of either of these acids*, or any of the gaseous forms which they assume, either singly or in states of admixture with other gases or vapours, be inhaled, the most severe effects on the respiratory passages and lungs are produced. When either nitric oxide gas, or nitrous acid vapour, hydrochloric acid gas, chlorine, or sulphurous acid, in more or less strong states, is attempted to be inspired, spasm of the glottis is produced by it, and its entrance into the respiratory organs is thereby prevented. In a weaker form, either of these acid vapours may pass into the lungs, but it irritates and inflames the mucous surface of the larynx and trachea, the inflammation extending along the bronchi to the air-cells and lungs, producing dangerous or even fatal laryngitis, bronchitis or pneumonia, or a complication of these. Several instances are on record of persons having been destroyed by the violent and extensive inflammation of the respiratory surfaces produced by these fumes, and by the nitric oxide gas converted into nitrous acid vapour by mixing with the atmosphere.

137. *e. The injection of either of these acids into mucous canals* with a criminal intention has been rarely recorded. But an instance is published in the *Medical Gazette* (vol. xvii. p. 623.), abridged from a French Journal, of sulphuric acid having been given in an enema by mistake for oil. As soon as the enema was injected, the patient uttered distressing screams, passed the night in the utmost agony, and died in the course of the following day. Numerous instances have been published of the murder of children with sulphuric or nitric acid, chiefly the former, which has generally been poured into the mouth or throat. When poisoning is effected in this way, the acid may not reach the stomach; it may not even get further than the pharynx or upper portion of the œsophagus. Being poured into the mouth or throat of the child when asleep or when crying or struggling, a portion of it irritates the epiglottis, or even escapes into the glottis, occasioning strangulating cough, and asphyxia by closure of the glottis, with violent inflammation or disorganization of the pharynx and adjoining parts, as observed in some cases when the acid has been swallowed accidentally.

138. *f. When either of these acids*, or an *admixture*

of these acids, has been swallowed, the effects vary comformably with the circumstances mentioned above (§ 51. *et seq.*). These effects have been most ably investigated by Tartra, with reference more especially to *nitric acid*, which, as well as the sulphuric and hydrochloric, may be employed for the purposes of suicide, or of murder, or may be swallowed accidentally. However taken, with whatever motive, or in whatever quantity or degree of concentration, the acid may not, especially when taken accidentally, reach further than the pharynx, or œsophagus, its acridity, the violence of its effects, or the discovery of a mistake, arresting deglutition, before any portion of it could have reached the stomach. Nevertheless fatal results may rapidly ensue owing either to the extensive disorganization of textures in, and adjoining to, the pharynx, or to the inflammation or corrosion of the larynx, the tumefaction of these parts closing the glottis, and either causing or threatening asphyxia. In these cases, although the acid may not reach further than the upper part of the œsophagus, the effect upon the larynx may be so violent as rapidly to produce suffocation, if tracheotomy be not performed. M. Tartra considers that the mineral acids produce effects which may be arranged as follows: — 1. Speedy death from violent corrosion and inflammation.—2. Slow death from a peculiar organic change of the stomach and intestines. — 3. Imperfect recovery, the person remaining liable ever after to irritability of the stomach. 4. The recovery of perfect health; but the operation, by means of asphyxia, caused in the way now stated, should be ranked as a *fifth* mode or variety.

139. *g. The most common symptoms are those of the first of these varieties*, namely, burning pain, and acrid acid taste in the mouth, extending to the throat; extreme heat and pain between the sternum and spine, extending to the epigastrium and stomach, where it is most excruciating, and attended by extreme anxiety, by most painful or impossible deglutition; and an increase of these on attempts to swallow, on pressure and on coughing. Eructations often take place from the stomach, and aggravate the sufferings of the patient, especially in the situations just named. The lips are commonly shrivelled, and are, at first, whitish, and afterwards yellowish, if nitric acid have been taken; and brownish, if sulphuric acid. Excoriations or corrosions, but rarely blisters, are sometimes observed on or about the lips, or on parts of the skin, with which the acid may have come in contact, as the cheeks, neck, breast, or fingers; and these marks undergo the same change of colour as observed in the lips and mouth. The inside of the mouth, and of the cheeks, is also more or less shrivelled, white, or corroded; and the teeth, often in a very few hours, become loose, brown, or yellowish-brown. The colour of the tongue varies with the acid, and the time which has elapsed from the application of the acid; but it is often yellowish or yellowish brown. Deglutition is so difficult, that attempts to take fluids are followed by the forcible rejection of them by the nose, the pharynx being spastically contracted. The matters vomited are generally brownish or black; and, if they fall on marble or lime-stone, they produce effervescence. Afterwards they are mixed with altered blood, and with membranous shreds, which resemble portions of the villous coat of the stomach, and sometimes actually consist of these, but most generally of coagulated mucus. The bowels are obstinately constipated, and the urine is scanty or suppressed. The abdomen, especially its upper regions, is tender and swollen. The pulse is very weak, and towards the close, very small, imperceptible or intermitting. It is seldom very frequent, and it may even continue but little or not at all accelerated throughout. The countenance, at first expressive of anxiety, pain, and distress, soon becomes collapsed, pale, and the extremities cold or clammy. The breathing is laborious, is often attended by singultus, and the movements of the diaphragm increase the pain of the stomach and epigastrium. In many cases, the irritation and swelling in the pharynx and epiglottis, or even in the larynx, cause fits of suffocative cough, with croupy respiration, and, where the larynx has been more particularly injured, suffocation may not merely be threatened, but actually produced.

140. In some instances, especially when the quantity of acid which has passed into the stomach has been large, the symptoms may be less excruciating but more rapid; whilst in others there may be a deceitful tranquillity, and life may be somewhat longer sustained. Thus, in the case adduced by Tartra, of a woman who had been intoxicated, and was poisoned by aqua-fortis mixed in wine, although there were both pain and vomiting at first, yet none of these symptoms were afterwards complained of, death taking place within twenty hours; but the intoxication probably obscured the sensibility, whilst the admixture with much wine modified the operation of the poison. The intellectual faculties generally remain unimpaired to the last. Should the patient survive the first effects of the poison, the mucous membrane of the fauces, pharynx, or œsophagus may be detached and discharged in irregular shreds, or in portions of considerable size, or even in a perfect cylinder.

141. *h. The duration* of this variety of corrosive poisoning may vary from two or four hours, as in the cases recorded by Remer and Sinclair to two or three days; but life may be prolonged to ten or fifteen days. The usual period is from twelve to forty-eight hours. *Death* may be caused altogether by asphyxia, owing to the closure of the larynx; and if tracheotomy be resorted to, life may be thereby prolonged, as in the case recorded by Mr. Arnott; but death more frequently results; the structural change, the violent impression made upon the nerves, the vital shock, the coagulation of the blood in the vessels of the parts with which the acid came in contact, and the local arrest of the circulation and of the associated vital functions, combining to produce the fatal issue.

142. *i.* The *quantity of* a mineral acid capable of producing fatal effects cannot be stated with any precision, as the result depends upon the several circumstances stated above (§ 51. *et seq.*). Dr. Christison remarks that the smallest fatal dose of sulphuric acid which he has found recorded was one drachm, which was taken with sugar by mistake for stomachic drops by a stout young man, and produced death in seven days. A man has recovered after taking six drachms. In a case of poisoning with hydrochloric acid, an ounce and a half proved fatal in about twenty-four hours; and in another case alluded to by Taylor, a man walked about three quarters of a mile after taking

nearly an ounce. Mr. Orr and Dr. Craigie refer to two cases of recovery, although two ounces of the concentrated sulphuric acid had been swallowed in each.

143. *k. The symptoms of the second of these varieties*, according to Tartra, are at first those already described, but they soon abate in violence. The patient then becomes affected with general fever, dry skin, difficult breathing, tension of the abdomen, spasms, and pains of the limbs, salivation, and occasional vomiting, particularly of food and drink. The salivation is attended by fœtor, and membranous flakes, resembling the villous coat of the stomach, are vomited. These flakes are most probably membranous exudations of lymph, resembling those of croup, thrown out on the excoriated and inflamed surface of the organ. Worms are sometimes discharged dead and excoriated by the acid. The functions of digestion and assimilation are arrested, or remarkably impaired, and the frame becomes extremely debilitated and emaciated. Death usually takes place in periods varying from a fortnight to several months. Tartra adduces an instance in which death did not take place until after eight months; the vomiting of membranous flakes continuing until the last.

144. *l. The third and fourth varieties* described by M. Tartra are characterized, as respects the *former* of these, chiefly by the greater mildness of the symptoms from the commencement, and by the patient continuing through life liable to attacks of pain in the stomach, vomiting of food, and general disorder of the digestive functions. The *latter* consists of cases of perfect recovery. Of 55 cases of poisoning by the mineral acids recorded by Tartra 26 died — 19 of the primary, and 7 of the secondary effects. Twenty-nine recovered, and of these 21 perfectly. Suicidal cases, for obvious reasons, were more frequently fatal than the accidental.

145. *m.* The strong mineral acids, as above mentioned (§§ 137, 138.), *may not reach the stomach*, especially when the poisoning is accidental or attempted criminally. The effects produced by them, under these circumstances, upon the pharynx, œsophagus, and larynx being often so violent as to occasion death in a few days. Several instances of this kind have been recorded; and, even when a person has discovered his mistake, and taken only a small portion, which could have reached no further than the pharynx or upper part of the gullet, partial recovery may take place, with stricture of the upper portion of the œsophagus; or fatal inflammation, of the pharynx and larynx, with or without asphyxia, may be the immediate result. That a large proportion of the children poisoned, by the abandoned classes, with the mineral acids, die from the effects of the poison on these parts, without reaching the stomach, is proved in some cases by the appearances observed after death; and is rendered probable in others by the circumstances under which the act is perpetrated. In the case recorded by Mr. Arnott, the injury was confined chiefly to the larynx and gullet, the stomach being distended with food and very little affected. The symptoms were general depression, with croupy respiration and threatened suffocation, for which tracheotomy was performed, with relief to the breathing; but the patient died with symptoms of general exhaustion, in 36 hours, without presenting any marked signs of the operation of the acid on the stomach.

146. In the circumstances and in the concentrated form, in which the stronger mineral acids are poisonous, whether taken accidentally, or with a suicidal intention, or given with a criminal object, danger or death arises chiefly from the local or structural change; comparatively little of the acid, as stated above (§ 134.), being carried into the circulation. But these acids may be taken in such states of *dilution* as will admit of their absorption, and action on the frame through the medium of the blood; and thus they may produce noxious effects, especially when given frequently, or in too large quantity, or a form of *slow poisoning*; but, as they do not act by producing a corrosive effect, when given in states of dilution which admit of their absorption, they will be considered, in this form of exhibition, under the class to which the different effects they then produce more appropriately belong.

147. *n. Appearances after death from the concentrated mineral acids* may be confined chiefly to the fauces, pharynx, larynx, and œsophagus, and may be comparatively slight in the stomach. The whole of the alimentary canal, from the mouth to the anus, should be examined, and the lesions of the upper portions should be carefully observed; as these portions, especially those particularized, suffer most in cases of poisoning with these substances. Spots on the skin, about the mouth and lips are often present, and should be examined. If the case have proved fatal within the usual period, and if the *concentrated sulphuric acid* have been swallowed, the inner surface of the mouth is generally white, softened and corroded, the mucous coat is readily detached, and the tissues underneath are of a dark red. The same change is observed in the fauces, pharynx, and œsophagus, the colour of the mucous surface of these parts sometimes being brownish or ash-grey. The mucous membrane is often more or less corroded, partially detached, and, in the œsophagus, assumes longitudinal plicæ, owing to the contraction of the canal and its partial detachment. The stomach is usually contracted, corroded, and sometimes perforated. When opened, its contents are commonly of a dark brown or black hue, of a tarry consistence, and consisting chiefly of altered blood and mucus. The existence of acidity depends upon the treatment and the period which had elapsed from the ingestion of the acid. The villous surface of the stomach is traversed by black striæ, is more or less corrugated, or it is generally of a brownish or black colour, which is not removed by washing. Between the rugæ and underneath the blackened membrane, the tissues are of a deep or dark red hue; but this redness and the blackness of the villous membrane are sometimes partial or in patches of various extent. The small intestines, especially when much of the acid has passed into the stomach, are more or less inflamed, their contents much resembling those of that viscus. When perforation of the stomach has taken place, all the coats are much softened, especially in the vicinity of the perforation, the margins of which are black, irregular, and very soft. The contents of the viscus may not have escaped through the aperture; but if they have passed through, the adjoining organs are generally altered by the acid. Mr. Taylor refers to a case in which the spleen, the

liver, and the coats of the aorta, were found corroded and blackened by the acid which had escaped through the perforation.

148. When the acid has been taken in a diluted state, or at least in a less concentrated form, and if the patient live some days or weeks, the œsophagus is more or less constricted, and its mucous surface inflamed or otherwise changed. Inflammatory lesions are commonly found in the stomach, and the corrosion or charring of the villous membrane is not so great as described above. The blood in the vessels is always very dark, that in the vessels of the stomach and spleen is almost black, and coagulated. In the more prolonged cases, the villous coat of both the œsophagus and stomach is either more or less abraded, ulcerated, or almost entirely destroyed. The pylorus is generally constricted. In these cases, the patient sinks from the irritability of the stomach, from the almost total arrest of the functions of digestion and assimilation, and from the action of the acid upon the blood and nervous systems. In some, at least, of these cases, and especially when the acid has been much diluted, a partial absorption of it into the circulation takes place, and changes the colour and state of the blood, and acts otherwise injuriously on the frame, as will be noticed more fully in the sequel.

149. *o. The appearances produced by the nitric and nitrous acids* are not materially different from those caused by sulphuric acid. The external surface of the lips often present yellowish or yellowish brown spots, the cuticle being easily detached. Yellowish spots are sometimes found about the neck, or on the hands. A yellow frothy liquid escapes from the mouth and nose. The abdomen is often distended with flatus. The inner surface of the mouth and cheeks is of a whitish or yellowish colour. The pharynx, larynx, and œsophagus are softened, tumefied, of a yellowish, or brown colour, and their mucous membrane is easily detached, or it is already detached in long shreds or folds. The stomach is similarly altered. It is rarely perforated, and is often distended with gas. The villous membrane presents extensive patches of a yellowish, brown, green, or black hue, and the coats of this viscus are remarkably softened throughout. The duodenum is often changed in a similar manner, although not so extensively; the other intestines are seldom much altered. The non-perforation of the stomach is most probably owing, as Mr. TAYLOR suggests, to the circumstance of the acid having been swallowed, in most instances, whilst the stomach contained much alimentary matters. When death takes place rapidly, the contents of this viscus generally yield more or less of the acid. When the larynx is implicated by swallowing this or any of the other strong mineral acids, more especially if suffocation have been thus produced, the lungs and mucous membrane of the trachea and bronchi are congested with black blood. In more chronic cases, especially if the patient has lived several weeks, softening, redness, and ulceration in various stages, of the mucous membrane of the œsophagus and stomach are found. The œsophagus is often constricted, and constriction is sometimes also met with in the pylorus and duodenum.

150. *p. The hydrochloric acid* produces similar symptoms and appearances after death to those which have been now described. Cases of poisoning by this acid are much more rare than by the other strong mineral acids; but those which have been observed with due attention present the same phenomena and lesions as are produced by nitric acid.

151. *q.* Instances of poisoning by an *admixture of mineral acids*—by the *nitric and muriatic acids* — *aqua regia* — which is often used in the arts for dissolving gold and platina — and by the *nitric and sulphuric acids*—*aqua reginæ* — which is employed for dissolving silver, may occur, but they have been very rarely met with. ORFILA has given one instance of poisoning by the latter of these combinations. The symptoms and post mortem appearances were much the same as those already stated, but approached the nearest to those caused by the nitric acid, which predominated in the mixture. The *nitro-muriatic acids* most probably produce symptoms and changes very closely resembling those described above, especially those in connection with nitric acid (§§ 139—149.)*; but they have not hitherto been recorded.

152. *r. Treatment.*—The difficulty of swallowing in almost every instance of poisoning by these acids is the great obstacle to the treatment of their effects. The means, and the intentions which should guide the employment of them, are obvious; but when the constriction of the pharynx, and the spasmodic action of the pharyngeal muscles are such that all articles are forcibly rejected upon every attempt to swallow them, the most influential antidotes and remedies are altogether prevented from exerting their effects. If, however, the patient be still able to swallow, calcined magnesia, or the carbonate of magnesia, should be instantly given in milk, or in any mucilaginous fluid; but if these are not immediately to be procured, finely powdered chalk, whiting, common soap or soda should be substituted, and taken in milk, or in water, or in oleaginous or mucilaginous fluids, according as either may be in instant readiness. The success of treatment entirely depends upon the rapidity with which the *antidote* is administered. Oleaginous and mucilaginous fluids should be freely administered. Linseed or olive oil, linseed tea, gruel, milk, are severally of use when they can be swallowed, either alone, or as the vehicles of the antidotes just named.

153. If swallowing be impossible, owing both to the constriction and to the tumefaction and irritability of the pharynx and œsophagus, the propriety of introducing the remedies now mentioned by the tube of the stomach-pump into the stomach should be considered. The tumefaction of the coats of these passages, the corrosion, and softening they have experienced, and their partial detachment, and the frequent recurrence of severe singultus, are often such as almost to preclude the introduction of the tube, and to risk perfora-

* The plan of my work and my limits prevent me from entering upon the *chemical analysis and tests* of the several poisons. If these topics cannot be fully discussed with reference to the states, combinations, &c, in which poisons should be investigated by the medical jurist, and to the various objections which may be urged against certain methods of analysis and tests, in ever varying circumstances, they should be entirely relinquished; and it is preferable that the reader should consult either of the able productions of BECK, CHRISTISON, ORFILA, DEVERGIE, TAYLOR, and GUY, as to these matters, than that I should give an insufficient account of them; and to such an account my limits must necessarily have confined me.

tion of the canal in the attempt. Orfila, in 1817, recommended a recourse to the stomach-pump, which, however, was first proposed by Boerhaave, and strongly advised by Renault and Dupuytren shortly before the recommendation of Orfila. But, although thus approved of, this apparatus appears never to have been brought into use until 1822, when its utility was demonstrated by the practitioners mentioned above (§ 100.). It is obvious that the prospect of having recourse to it with advantage, in the circumstances now under consideration, must depend upon the peculiarities of the case, and the acumen and dexterity of the surgeon.

154. When the larynx is affected, causing difficulty of breathing approaching to suffocation, *tracheotomy* should be performed; nor should this operation be then delayed, as prolonged difficulty of breathing causes more or less congestion of the lungs and bronchial membrane, which always accelerates a fatal issue, which issue the lesions of the stomach and œsophagus, might not otherwise have produced.

155. Having neutralized the acid, our chief endeavours should be next directed to the removal of the effects which may be inferred to have been produced by it. Mucilaginous fluids, almond or spermaceti emulsions, gruel, decoction of marshmallows, gum-water, sugared water, thin broths, especially veal broths and jellies, may be severally given, and warm-baths may be allowed. If the patient complain of colicky pains, of dysuria, or of tenesmus, starch or other demulcent and oleaginous enemata, especially those with olive oil, with gruel or with veal or mutton broths, &c., should be administered from time to time, for, under any circumstance of the case, these enemata will be of service.

156. The symptoms of *pharyngitis*, or of *œsophagitis*, or of *gastritis*, or of the association of these affections, which frequently continue until either a fatal issue or recovery results, should be treated conformably with the principles advised for these maladies. But generally the amount of vascular depletions required for the idiopathic sthenic inflammations of the alimentary canal, is not required after poisoning by these strong acids. The frame has received both a severe injury of its vital organs, and a violent shock; and the former generally prevents the re-action usually consequent upon the latter. Hence venesection may not be required, or it may even be dangerous; the habit of body, strength, age, and circumstances of the case, in connection with the degree and character of existing vascular action, being the guides to the adoption either of this practice or of moderate local depletions, or merely of emollients, of demulcent broths, of mucilaginous diluents, of gelatinous and farinaceous articles, and of external derivatives.

157. The irritability of the stomach, and the spasms and pains of the voluntary muscles and extremities which often continue for several days, both in cases which recover and in those which end fatally—these pains and spasms being caused by the injury and irritation sustained by the visceral or ganglial nerves, the morbid conditions of these nerves being extended to the sensory nerves, and reflected upon the voluntary muscles by the motory nerves—are amongst the most distressing symptoms which are afterwards experienced, and are alleviated with the greatest difficulty. In these circumstances, emollient and tonic substances may be given, in small and frequent doses, with opium, or the tinctura camphoræ composita; or the simple infusion of roses may be prescribed, with tinctura opii; or the compound tragacanth powder, with the pulvis cretæ compositus cum opio &c.; and warm terebinthinate epithemes or embrocations should be repeatedly applied to the abdomen. Nourishment of a mucilaginous, gelatinous or demulcent kind should be taken in small quantity and at short intervals; and if deglutition continue difficult, strong broths and animal decoctions ought to be administered *per anum*. For this latter important and sometimes fatal affection, the emollient linctuses and other means recommended for *acute and chronic inflammations and stricture of the œsophagus* (Art. Œsophagus, §§ 43. *et seq.*) may be appropriately had recourse to. (See also Stomach—*Diseases of.*)

158. *s. Sulphate of Indigo.*—Poisoning by this substance is chiefly accidental. Mr. Taylor has observed that, as this compound is nothing more than a solution of indigo in sulphuric acid, the symptoms and post mortem appearances caused by it are the same as those which have been described as produced by the latter substance. Poisoning by it may be suspected, when, with these symptoms, the internal surface of the mouth has a blue colour; the vomited matters also having a deep blue tint. In two instances, in which about an ounce each was swallowed, death took place; in one case eleven hours afterwards, and, in the other, in seven hours and a half; it was remarked, that the urine which was passed had a bluish tinge, indicating the absorption of some portion of this compound into the circulation.—The *treatment* of poisoning by the sulphate of indigo is not different from that directed for the effects of the mineral acids.

159. *C.* Oxalic Acid.—Poisoning by this acid is generally accidental or suicidal. Of nineteen cases of poisoning by this substance in the Coroners' return for 1837 and 1838, fourteen were suicidal. Owing to the resemblance of this acid to Epsom salts, it has sometimes been taken for them. Mr. Taylor thinks that its intensely acid taste prevents it from being often used with criminal intentions; although he has known several instances of murder having been attempted by it.

160. *a. The symptoms* are immediate, and so intense as often to have destroyed life before the arrival of the practitioner. If the poison be taken in large quantity—from half an ounce to an ounce dissolved in water,—a burning acid sensation is felt in the fauces, throat, and œsophagus, followed immediately by vomiting. In some instances the impression of the acid on the stomach has been so intense as to paralyse this viscus, and the parts associated with it in the act, and little or no vomiting has occurred, death, however, rapidly taking place; in other cases, the vomiting has been incessant until death. The vomited matters are intensely acid, and have a green, or nearly black, colour; consisting of the alimentary substances, and afterwards chiefly of altered mucus and blood. Extreme anxiety, pain, and tenderness, are felt at the epigastrium; and often, in both, hypochondria, followed by spasms, singultus, convulsions, collapse of the features, and of all the vital actions, by clammy perspira-

tions, and cold extremities. Attending these there are often also stupor, unconsciousness, a small, irregular, and almost imperceptible pulse, deep and slow respiration, numbness of the limbs, and death.

161. In smaller quantity, and in somewhat greater dilution, the sensation of acidity, of burning in the throat, and the vomiting varies accordingly. Should the patient survive some time, owing either to the quantity of the poison taken, to the presence of food in the stomach, or to the discharge of the greater portion of the acid by vomiting, soreness and constriction of the throat, painful and difficult deglutition, irritability of the stomach, thirst, tenderness at the epigastrium, hiccup, diarrhœa, flatulence, and great depression of the vital powers are the most constant symptoms. Soreness of the mouth, swelling of the tongue, and numbness and tingling of the limbs, are often also experienced; the patient either dying after two, three, or several days, or slowly and altogether recovering. But recovery is generally attended and followed by more or less disorder, or tendency to disorder, of the digestive organs.

162. *b. The quantity of oxalic acid* which may destroy a human life has not been determined. The immediate rejection or the retention of the poison by the stomach, and the promptness or absence of medical aid, necessarily determine the result. Mr. SEMPLE recorded a case in which two drachms dissolved in water were swallowed. Vomiting took place immediately, and the symptoms had nearly disappeared in about twelve hours. A man swallowed three drachms: vomiting instantly occurred, and he recovered in a few hours. A girl is stated by Dr. BABINGTON, of Coleraine, to have taken forty grains: severe symptoms of gastric irritation supervened; but although, as in the other cases, medical aid was procured, the recovery was protracted. Mr. TAYLOR states, that a smaller dose than half an ounce generally has not been fatal; although it may be inferred, from the very dangerous effects caused by much smaller quantities, that much less than this may destroy life, if judicious treatment be not resorted to. When the dose of this poison is upwards of half an ounce, death is commonly the result; but instances of recovery have occurred where the quantity was much greater than this, and judicious treatment has been promptly administered.

163. *c. The period at which death may take place*, varies with the circumstances already alluded to. Dr. CHRISTISON mentions a case where an ounce of this poison killed a girl in thirty minutes, and another where the same quantity was fatal in ten minutes, this being the shortest period on record. When the dose is half an ounce, or upwards, death commonly takes place within an hour or two. But instances have occurred in which life has been prolonged for thirteen or fourteen hours. Mr. FRAZER has recorded a case which was prolonged to twenty-three days; irritability of stomach, singultus, fever, and exhaustion being the prominent symptoms.

164. *d. Appearances after death.*—The mucous membrane of the mouth, fauces, and œsophagus is usually white; but it is sometimes partially covered by the dark matters discharged by the stomach. This membrane may be readily detached in these situations, as well as in the stomach. This organ is commonly much softened and pulpy, and contains a dark-brown acid liquid resembling coffee-grounds, from the admixture of altered blood with it. Blood-vessels are seen ramified distended by coagulated black blood. In a case where nearly two ounces were taken and death was rapid, the coats of the stomach presented nearly as carbonized an appearance as that occasioned by sulphuric acid. The œsophagus presents similar changes. It is generally pale, seems as if boiled in water, and its inner membrane is raised in longitudinal rugæ or folds, interrupted by patches of abrasion. The upper portions of the intestines, especially the duodenum, are sometimes slightly inflamed or softened, but they are not otherwise remarkably altered. In Mr. FRAZER's case, in which life was prolonged twenty-three days, the villous coat of the stomach and gullet was either softened or entirely detached. The muscular coat was exposed in several places; and was thickened, softened, injected, and inflamed. This acid has not so corrosive an action on the coats of the stomach as the strong mineral acids, as it rarely entirely perforates these coats, although it softens them and destroys their physical as well as vital cohesion. In some instances the inner surface of the trachea has been found inflamed, owing to its anatomical connection with the œsophagus. In a few cases, the lesions have been very slight, although the symptoms were severe; but little beyond softening of the coats of the stomach having been remarked.

165. *e. Death is the result* of the corrosive action of this acid upon the organization of the upper portions of the digestive canal, especially of the stomach, the nerves of the organ being more particularly affected. But the operation of this poison is thus limited, only when large doses of it are taken; and then the local injury and disorganization and consequent vital shock are sufficient to destroy life. It has not been found to affect the larynx so as to threaten suffocation. When swallowed in smaller quantity, or in states of dilution, it is manifestly absorbed, and acts upon the nervous system and on the blood (§ 25. *et seq.*). Much of the change observed both in the tissues of the stomach and in the blood, in cases of rapid poisoning by this substance, has arisen from the action of such portions of it as have still remained in, or been imbibed by the stomach at the time of death, the changes found on inspection having been partly thus produced *post mortem*.

166. *f. Treatment.*—The *antidotes* against this poison should be most promptly resorted to. The best are chalk, calcined magnesia, or the carbonate of magnesia. These should be abundantly mixed in water, or milk, or in any oleaginous or demulcent fluid instantly at hand. Lime-water and oil may also be given. As chalk is the best antidote, Dr. CHRISTISON advises, that even the plaster of the apartment should be broken down in order to be given; but it would be difficult to reduce the plaster in a very short time to a powder sufficiently fine to admit of admixture, and of deglutition in the existing state of the patient. Free dilution — copious draughts of demulcents, emollient decoctions, &c. are generally of use; but they should be given in large quantities, and their rejection by irritating the fauces should be encouraged. If dilution be not free and frequent, it may be in-

jurious, by dissolving the poison and by favouring its absorption. If vomiting can be produced after the antidotes and much fluid have been taken, it should be encouraged by means of oleaginous and emollient fluids; but recourse to the stomach-pump is of doubtful efficacy, as it may injure, or even perforate the softened coats of the œsophagus and stomach. When it can be easily introduced, and when there is little or no singultus, antidotes and demulcent fluids having been already freely swallowed, then it may be of use, if vomiting does not take place, for the removal of the contents of the stomach, and for the introduction of remedial agents when deglutition cannot be accomplished. But it should not be overlooked, that the pharynx and gullet have sustained nearly as great an injury as the stomach, and that the too early use of this apparatus will prevent the antidotes and other medicinal substances which should be swallowed from exerting a salutary effect upon those parts. As the salts which the alkalies form with oxalic acid are as injurious as this acid itself, neither the alkalies nor their carbonates should be given after poisoning with it. The consecutive effects of this substance should be treated as those of other corrosive poisons, or as the operation of this acid requires when given in small or diluted doses, and when acting as will hereafter be shown (See next Class).

167. ii. Alkalies.—*Ammonia, potash, soda, and their carbonates: — pearlash, soap-lees. — a.* The *vapour of strong ammonia* may rapidly destroy life, when *inhaled*, by producing acute inflammation of the larynx and trachea, often extending to the bronchi and lungs, and all the symptoms of violent croup. When ammonia is held too near the nostrils to rouse persons from syncope, its vapour may act more or less as an irritant of the respiratory mucous surfaces, and be injurious not only in this way, but also in as far as it prevents a due supply of air to the lungs.

168. *b. The symptoms occasioned by the fixed alkalies*, when taken in large quantities, are nearly the same as respects the caustic states of these alkalies; the subcarbonates and carbonates being more mild in their operation. Poisoning by these substances is generally caused by accident. When the caustic alkalies are swallowed, an acrid, corroding taste and pain, with a sensation of burning and excoriation, are felt in the mouth and throat; these latter sensations proceeding along the œsophagus to the stomach and epigastrium Vomiting often occurs, and the matters thrown off usually consist of soft substances, resembling the softened detached portions of the villous tissue, with mucus, often mixed with dark discoloured blood, and with alimentary articles more or less altered, in the first instance. Both these and other associated symptoms vary with the concentration and quantity of the alkali; but vital depression soon appears. The mouth, tongue, and throat present a tumefied, soft, flabby, and inflamed appearance; the surface becomes cold and clammy; the pulse feeble, small, and quick; singultus is often present; the pain extends to the central and lower regions of the abdomen, and diarrhœa supervenes and becomes urgent and exhausting. The symptoms are somewhat less severe when the carbonates have been taken; unless the dose of these has been very large and the solution very strong.

169. *c. Ammonia* and its sesquicarbonate produces nearly the same symptoms as the fixed alkalies; the chief differences being, that strong solutions of the former occasion a more violent burning pain in the fauces, œsophagus, and stomach, than the latter, the larynx being oftener implicated. But poisoning by ammonia is not common, cases of it occurring chiefly by mistake, which is most frequently discovered before much of it is swallowed; and then the fauces, phayrnx, larynx, and œsophagus are severally more or less affected, according to the strength of the solution. Ammonia is not so productive of vomiting as the fixed alkalies, when taken in poisonous doses, the symptoms being more closely allied to those of gastritis, associated with enteritis and œsophagitis; and it seldom occasions diarrhœa. In the more concentrated states ammonia also occasions singultus and convulsions.

170. *d.* The *quantity* required of these substances to produce death necessarily varies with the concentration of the solution, and with the state of the stomach as respects the quantity of aliments in it, and other circumstances. The caustic alkalies are fatal in smaller quantity and in less time than the carbonates and the preparations of ammonia. Orfila adduces two instances in which half an ounce of the carbonate of potash was fatal, the patients having lingered for several months. The exact quantity, however, cannot be assigned; for a comparatively small one, if the alkali be caustic, or if it implicate the larynx, may be rapidly fatal.

171. *e.* The *duration* of the symptoms, or period which usually elapses until death occurs, may be very short, especially as respects the caustic alkalies. Mr. Taylor estimates the shortest period at three hours; and in this case death was caused by three ounces of a strong solution of the carbonate of potash. When the substance attacks the larynx, as often occurs in respect of the mineral acids, this period will also be short. The more immediate effects of the caustic alkalies usually terminate fatally in two or three days; the softening and disorganization of the villous surface of the digestive canal, and the arrest of circulation in the vessels supplying this canal, terminating life in a very few days, and even in a shorter time, if the extent of injury be such as occasion severe vital shocks in addition. When the injury is less, or the vital resistance to it greater, the patient may linger for weeks or even months; the solution, abrasion, or excoriation of the villous surface of the stomach, and of other parts of the canal, being attended by pain and tenderness in the hypochondria and other regions of the abdomen, with vomitings, anorexia, indigestion, diarrhœa, and often also with difficult or nearly impossible deglutition. Owing to the injury or destruction of the digestive villous surface, digestion and assimilation are impaired or arrested, and the patient sinks from the inanition thus occasioned by the local injury; whatever amount of absorption of the poison may have taken place into the circulation, in cases where the substance has been more diluted, and the local injury less, acting a very subordinate part in producing the ultimate result.

172. *f.* The *appearances after death* consist chiefly of a diffluent softening, abrasion, or detachment of large portions of the villous surface of the fauces

pharynx, œsophagus, and stomach; and sometimes also of parts of the duodenum and intestines. The internal surface of the canal, especially of the stomach, presents a chocolate colour; and the contents are fluid, viscid, and often dark from the admixture of exuded blood. The softening of the coats of the stomach sometimes extends to all the coats, but especially to the more internal; and much resembles the gelatinous softening met with in the stomach in rare instances, and attributed to the action of the gastric juices after death (see §§ 84—87.); but there have been more tumefaction and darker discolouration in the poisoning now being considered. When death has been produced by ammonia or its sesquicarbonate the softening and tumefaction have been attended by signs of inflammation and excoriation, inflammatory appearances existing also in the trachea and larynx.

173. *g.* Of the *action* of the alkalies and their carbonates it may be concluded, that, in their concentrated states, in large quantities they are fatal chiefly by their local action, in the way stated above (§§ 171, 172.); and that, in weaker forms, or in small doses, they are more or less absorbed, as demonstrated by the composition of the urine, and other secretions; but they are generally eliminated by the emunctions before they accumulate in the blood to a very injurious amount.*

174. *h. The treatment of the alkaline poisons* consists in the immediate exhibition of fluids containing vinegar, or any of the vegetable acids which may be obtained with the least delay. If any of these be not quite at hand, draughts of beer or of malt liquors; or demulcents with oil, or milk, gruel, &c., may be taken until these acids are procured. A tepid infusion of chamomile flowers is afterwards of use in promoting vomiting, and it may be given with or without moderate doses of the sulphate of zinc. The stomach-pump may be more injurious than beneficial, especially if the caustic fixed alkalies have been taken, for the tumefaction and softening of the coats of the œsophagus and stomach are often so great as to render it difficult to introduce the tube without causing laceration or injury.

The *treatment* of the secondary effects of these poisons consists chiefly in removing the effects which may be inferred from the symptoms still to continue. At first demulcents, oleaginous and emollient substances may be administered, and afterwards gelatinous and farinaceous articles of food in small quantities may be given. An attempt may be made, with caution, to restore the tone of the villous surface, by giving small doses of *creosote* with demulcents, or of the pyroligneous acetic acid, or the compound infusion of roses with small doses of quinine, or of the sulphate of zinc, or such of the tonic and astringent infusions or decoctions as may be found to agree the best with the stomach. When the difficulty of swallowing and continued irritability of the stomach excite fears of abrasions of the villous coat of the digestive canal, and if diarrhœa warrant the supposition that this lesion extends as low as portions of the intestinal tube, then astringents and tonics, vegetable or mineral, as either appears most appropriate, should be given in small but frequent doses, with small quantities of opium, in demulcent and emollient vehicles. By attempting to support vital power by suitable means, and to restore the tone of those parts of the villous surface which have been the least injured, nature will thereby be the better able to reproduce in some measure the abraded portions, or in some way to supply their functions. In other respects the treatment, the diet and the regimen, should be adapted to the features of particular cases, with a careful observation of the *juvantia* and *lædentia*.

175. iii. ANTIMONY — CHLORIDE OF. — *Butter of Antimony.* — This is the only preparation of antimony which I shall notice as a *corrosive poison*; the other preparations of this metal being more or less absorbed, and acting otherwise on the system. The *chloride*, as usually employed, is a very corrosive liquid, varying in colour, according to the quantity of iron it contains, from a light yellow to a dark red. Poisoning rarely occurs from it. Mr. TAYLOR, however, refers to three cases which have been recently recorded: two were caused by mistake, one intentionally; and, in this last, between two and three ounces of this solution were swallowed.

176. *a.* The *Symptoms* were, in many respects, the same as those described above as being caused by the caustic alkalies: a burning pain in the throat course of the œsophagus and stomach; constant efforts to vomit; collapse of the features, coldness of the surface and extremities and faintness; a small, weak and frequent pulse; pains in the abdomen, with tenesmus, but no evacuations. To these succeeded drowsiness, convulsions, and, in the suicidal case, death in ten and a half hours. The two accidental cases recovered, much smaller quantities of the poison having been taken.

177. *b. On inspection after death*, the fatal case presented the internal surface of the digestive canal, from the mouth to the jejunum, of a black and charred appearance. The mucous membrane was destroyed throughout this extent: "there was none of this membrane in general remaining, only a flocculent substance, which could be easily scraped off with the back of the scalpel." The subjacent coats were so soft as to be torn with the greatest ease.

178. *c.* The *treatment* should consist chiefly of copious draughts of water, or emollients and demulcents containing sugar, and, after free vomiting has been procured, with opium or syrup of poppies. If vomiting does not immediately follow the ingestion of this poison, ORFILA recommends that a decoction of conchona, or of willow or oak bark, or of powdered gallnuts, should be freely taken as soon as possible. The treatment of this poison does not differ from that advised for the fixed alkalies as respects either these substances or those mentioned under that head. *See also the preparations of antimony* in CLASS V. — ACRO-SEDATIVE POISONS.

179. iv. IODINE AND BROMINE. — *A. a. Iodine* acts differently on the œconomy according to the concentration of the tincture or solution of it which

* *When injected into the veins*, ORFILA believed that the alkalies caused death by coagulating the blood. I find it remarked in my note-book, when detailing some experiments with the alkalies, in which I was concerned in 1820, that "the alkalies and their carbonates, when injected into the veins, appear to destroy life by impairing organic nervous energy, the irritability of the heart, and the functions of the brain, and by their influence on the nervous masses and structures whilst circulating in the blood vessels and capillaries."

may be used. In a state of strong spirituous or ætherial solution it acts as a powerful corrosive of the tissues to which it may be applied; but in weaker solutions, and in various states of combination, it is much less corrosive, or is merely an irritant, and is more or less copiously absorbed into the circulation. In these states, it acts as an irritant and alterative—or *acro-alterative poison*, in which class I have considered it and its preparations.

180. *b.* The *fumes of iodine*, when inhaled, produce a violently irritating effect upon the respiratory passages, especially the larynx and trachea. If the vapour is concentrated, it occasions constrictive irritation and inflammation of these parts, which may be followed by asphyxia. In milder states, it occasions inflammation of the air-passages, with or without pneumonia. I have seen more than one case in which the vapour of iodine had been resorted to in the treatment of pulmonary consumption, with the effect of producing dangerous bronchitis, owing to the strength of the vapour which had been inhaled.

181. *c. Applied externally*, iodine, in a concentrated or pure state, or in that of a strong tincture, acts as a caustic, and changes the cuticle to an orange-yellow colour, causing desquamation, and, if allowed to remain, inflammation and destruction of the tissue with which it comes in contact. In weaker states of solution it acts as a desiccant of secreting or mucous surfaces, and inflames them more or less intensely. Hence, if injected, even in these states, into mucous canals, or taken into the stomach, it would act as an acrid corrosive poison.

182. *d. When iodine is swallowed*, in a more or less pure or concentrated form, it produces the most violent sufferings, especially if the quantity be large; but the effects vary remarkably with the state and contents of the stomach at the time of its ingestion; for if this viscus contain much bread, potatoes, or farinaceous or amylaceous articles of food, the iodine will be thereby rendered much milder in action, by forming an iodide of starch, as Dr. Pereira has remarked. Spirituous solutions of iodine, or the iodureted solutions of the iodide of potassium, when swallowed in more or less strong or concentrated forms, cause a most acrid sensation with constriction, burning pain, and dryness of the throat, descending down the œsophagus to the stomach, where they produce lacerating pains and efforts to vomit, extreme thirst, tenderness of the epigastrium, with anxiety, tremors, loss of strength, palpitations, faintness, sinking of the pulse, suffusion of the eyes, and restlessness. Dr. Jahn mentions a case, in which an over-dose occasioned violent pain in the abdomen, vomiting, profuse bloody diarrhœa, coldness and blanching of the skin, rigors, rapid pulse, &c. In a case noticed by Dr. Christison, a drachm and a half of the iodureted solution of the iodide of potassium produced acute pain and burning in the pit of the stomach, nausea, followed by vomiting of yellowish matters, which had the taste of iodine; by restlessness, headache, giddiness and pallor of the countenance; and by recovery after five days. In a fatal case recorded by Zink (*Journ. Complim.* t. xviii. p. 126.), the symptoms were restlessness, burning heat and dryness felt from the throat along the course of the œsophagus to the stomach, unquenchable thirst; palpitations, and a frequent, unequal and weak pulse, violent priapism, copious diarrhœa, parched tongue, tremors and faintness. The patient was bled; the blood was cupped and buffed. He died after five weeks. In another case in which the tincture of iodine caused slow poisoning and death, M. Zink found the following lesions:—

183. *e. Appearances after death.* The intestines were distended with gases; effusion had taken into the peritoneum; and adhesions had formed between several of the viscera. The gullet was much reddened internally, and remarkably constricted. The stomach was distended, and was externally inflamed in patches, and in one place apparently excoriated. It was inflamed internally, and corroded to a great extent near to the pylorus; the peritoneum covering the corroded part was detached and perforated with numerous small holes. The intestines were reddened and inflamed in places with patches approaching to sphacelation. The liver was enlarged, and of pale red or rose colour. The gall-bladder contained a large biliary calculus. The spleen seemed inflamed in some places. The pleura contained some serum.

184. *f.* The *quantity* of this poison required to destroy life depends upon the concentration of the solution employed, and the nature and quantity of the aliments in the stomach. When the iodine is pure or in large quantity, in whatever state it may be employed, it acts as a corrosive or caustic poison, causing death by its local action. In states of weaker solution, or in combinations which weaken its action, or in small doses often repeated, it produces *slow poisoning* as will be shown hereafter. It is then absorbed, and it accumulates in the system, producing emaciation and various morbid changes. The quantity required or the time taken to produce death has rarely been remarked in respect of this poison. Dr. Gardner states that a scruple of pure iodine, in the form of tincture, destroyed a child four years of age in a few hours.

185. *g.* The *treatment* of the more corrosive states in which iodine may be given is not satisfactory. The stomach-pump should be early employed, and vomiting encouraged by giving fluids containing amylaceous and farinaceous substances. Starch enemata should also be thrown up; and demulcents taken frequently. In other respects, the treatment should be the same as recommended for *gastritis*.

186. *B.* Bromine is but little known as a poison. Its vapour is most irritating when brought in contact with the conjunctiva.—*a.* When its vapour is *inhaled*, violent cough, a feeling of suffocation, with dryness and constriction of the larynx, are occasioned, and are soon followed either by inflammation of the respiratory passages, or by asphyxia. Franz had violent cough, and sense of suffocation, followed by headach, instantly after momentarily breathing the vapour of bromine.

187. *b.* When a *watery solution is injected into the veins*, according to the experiments of Franz, Barthez, Dieffenbach and Butzke, it appears to coagulate the blood, and causes immediate death, preceded by convulsions.

188. *c. Taken into the stomach*, it is a more corrosive poison even than iodine. Butzke, after swallowing a drop and a half of this substance, in half an ounce of water, felt heat in the mouth,

œsophagus, and stomach, followed by colicky pains. Two drops occasioned nausea, hiccup, and increased secretion of mucus. (See CHRISTISON, on Poisons, p. 1 5., and PEREIRA's *Mat. Med.*, vol. i. p. 260.) From these experiments it is evident that bromine acts in a similar way to iodine in every respect; but that it is poisonous in smaller quantities than iodine, although the *symptoms* and changes produced by it in the digestive canal are the same as those occasioned by that substance. The *treatment* is the same for both poisons.

189. v. LIME acts as a corrosive poison when taken into the stomach, or applied to a vital part, in its caustic and unslaked state; but it is rarely so employed, even accidentally; two cases of this kind only being noticed by medico-legal writers. It is evident, from its caustic action, that the ingestion of it, or its introduction into mucous canals, will be followed by corrosion, and inflammation of the tissues with which it comes in contact. When employed in its quick state, it will even decompose or destroy the structures by imbibing their watery, or fluid constituents.

190. *a.* When *swallowed*, it occasions heat, constriction, and pain in the throat, descending to the stomach, with unquenchable thirst, nausea, retchings, severe colicky pains, constipation, and the usual symptoms of corrosive poisoning, followed by nearly the same *changes* as have been already described, especially inflammation and corrosion of the parts with which it had come in contact.

191. *b.* The *treatment* should be the same, as respects *antidotes*, as that advised for poisoning by the fixed alkalies (§ 174.), especially an immediate recourse to vinegar, lemon-juice, or any vegetable acid, and to demulcent drinks. Subsequently, if symptoms of gastritis, or gastro-enteritis are developed, vascular depletions, and the usual treatment of these diseases should be prescribed.

192. vi. PHOSPHORUS, when minutely divided, proves a violent corrosive poison. According to the experiments of MAGENDIE and ORFILA, when it is dissolved in oil and *injected into the veins*, it occasions almost instantaneous inflammation of the bronchi and substance of the lungs.

193. *a.* It may be *taken into the stomach* either as an empirical remedy or accidentally: but its effects on man have not been often observed. It was at one time much employed, in small doses, in medical practice, especially as an aphrodisiac, and it probably occasioned dangerous symptoms even when thus prescribed. It is generally *slow* in its operation, although it is poisonous in very small quantities, particularly when melted in warm water or in oil. The most rapidly fatal case I find noticed is that by Dr. FLACHSLAND. A young man took, at the recommendation of a quack, some of this substance on bread and butter, to cure general debility, constipation, and impotence. He was immediately seized with violent pain in the stomach, continual retchings, discharges after injections that shone in the dark; and he died in forty hours. The quantity of phosphorus taken was not known. Dr. CHRISTISON states, that a grain and half proved fatal in a case which was mentioned by M. WORBE. A stout young man, having taken half a grain without injury, took a grain and a half in hot water. Seven hours afterwards he was attacked with pain in the stomach and bowels, with incessant vomiting and diarrhœa, excessive tenderness and tension of the belly, and died exhausted in twelve days. M. JULIA-FONTENELLE relates the case of an apothecary who, after taking in one day first one grain of phosphorus, and then two grains, without experiencing any effects, swallowed next day three grains at once in syrup. In the evening he felt generally uneasy from a sense of pressure and constriction in the abdomen, which continued for three days, when he was seized with violent and continual vomiting of matters which had an alliaceous odour. On the seventh day, spasms, delirium, and palsy of the left hand supervened, and death speedily ensued. It is manifest that, if applied to wounds, or introduced into any of the natural canals, the effects would be very violent, and even fatal after a longer or shorter period.

194. *b.* The *morbid appearances* after poisoning with this substance have been recorded only in the cases observed by WORBE and FLACHSLAND (§ 193.). In the case of the former, where only one grain and a half of this poison were taken, the skin was generally yellow, and livid in places. The lungs were gorged with blood. The muscular coat of the stomach was inflamed. The other coats near the two extremities of the organ were black. In Dr. FLACHSLAND's case, much fluid blood was discharged on making the first incisions. The omentum and external surfaces of the stomach and intestines were red. The villous coat of the stomach presented an appearance of gangrenous inflammation, which Dr. CHRISTISON suggests to have been black extravasation only; and the duodenum was similarly affected. The large intestines were contracted to the size of the little finger, and the mesenteric glands were enlarged. The kidneys and spleen were inflamed.

195. *c. Treatment.* — Large quantities of demulcent liquids should be exhibited, and magnesia given to neutralize any phosphorous and phosphoric acids which may be formed. Vomitings should be early encouraged by large mucilaginous draughts; and inflammation allayed by general and local depletions, or the latter only, or both, according to the peculiarities of the case. Dr. PEREIRA advises parts burnt with phosphorus to be washed with a weak alkaline solution, to remove any phosphorus acid which may perpetuate the irritation.

196. vii. SALTS, CORROSIVE ALKALINE—*Saline Caustics.*—Of the *alkaline salts*, the most *corrosive* are the *bichromate of potash* and the *binoxalate of potash*. Several other alkaline salts, which have usually been arranged with corrosive poisons, exert their fatal influences otherwise than by any corrosive effect they produce on the digestive canal; this effect never amounting to more than irritation and inflammation, which are of themselves insufficient to cause death in the short period sometimes observed.

197. *A.* The *bichromate of potash* is extensively used in dyeing. Accidents may hence occur from it, although it may not be resorted to with suicidal or criminal intentions. In a case in which a strong solution of it was taken, burning pain in the throat, violent vomiting, and the other symptoms of corrosive poisoning, and death in five hours, were occasioned. On *examination* after death, extensive destruction of the mucous membrane of the stomach and small intestine was

found. Dr. Christison remarks that, when this salt was first introduced into the art of dyeing, the workmen, who had their hands frequently immersed in its solution, were attacked with obstinate ulcers in the parts touched by it, and that these sores gradually extended deeper and deeper without spreading, until they actually sometimes made their way through the arm or hand.

193. *B.* The *binoxalate of potash*, when taken into the stomach, produces the same *symptoms* and *structural lesions* as have been described as the consequences of the ingestion of *oxalic acid*; and the treatment of instances of poisoning by the bichromate of potash, or by it, differs in no way from what has been advised for poisoning with that acid (§ 166.).

199. viii. Salts—Metallic.—Several of these salts exert a corrosive action on the living tissues; and, when taken into the stomach, in states of strong solution or in substance, they destroy life chiefly in virtue of this action; but, in smaller doses, and in weaker solutions, they act differently, are more or less abundantly absorbed, and produce effects which rank them under certain of the *classes* of poisons to be considered in the sequel. It is chiefly with reference to this corrosive and local action that I have here to notice them.

200. *A. Antimony.* — The several preparations of antimony liable to become poisonous, with the exception of the *chloride*, (§ 175.), act as irritant and depressing agents, and are therefore treated of in the Class, *Acro-sedative poisons.*

201. *B.* Bismuth — *Subnitrate of* — *Magistery of Bismuth* — *Bismuthi trisnitras.* — Poisoning by this substance has rarely occurred. In the experiments of Orfila, forty grains of the *nitrate of bismuth* introduced into the stomach of a dog produced all the symptoms of corrosive poisoning, and death in twenty-four hours; the villous coat of the stomach being reduced to a pulpy mass, and eroded in parts. The *subnitrate* was found to produce the same symptoms and lesions as the nitrate, but a much larger dose was required.

202. *a.* In a case in which the *trisnitrate* was taken, in the dose of two drachms, the patient was immediately attacked with burning pain in the throat, vomiting of brown matters, purging of watery stools, cramps, and coldness of the limbs, intermitting pulse; followed by inflammation of the throat, difficult deglutition, a constant nauseous metallic taste, hiccup, laborious breathing, suppression of urine, swelling, and tension of the belly, salivation, delirium, &c. He died on the ninth day.

203. *b.* On *inspection* it was found that, from the pharynx to the rectum, their were but few points of the digestive canal free from change. The tonsils, uvula, pharynx and epiglottis were gangrenous, the larynx spotted black, the gullet livid, the stomach very red, with numerous purple pimples; and the whole intestinal canal was red and gangrenous in places, especially at the rectum. The endocardium was bright red. Probably in this case there was partial absorption of the salt, which had thus inflamed the endocardium; if, indeed, the redness was not merely the result of *post mortem* coloration.

204. *c. Treatment.* — No chemical *antidote* is known to this poison. Emollient drinks should be given abundantly, and the poison evacuated from the stomach as speedily as possible by means of the stomach-pump, or otherwise. Afterwards demulcent enemata ought to be administered. A strictly antiphlogistic treatment should be adopted, to prevent inflammation, or to remove it if it have supervened. Opiates in full doses, camphor and demulcents should also be exhibited.

205. *C.* Copper — *The preparations and compounds of*, are violent poisons; but although they produce an active emetic effect when taken into the stomach, they act in large doses more upon the nervous system, than locally, or as corrosive or caustic agents. These preparations have seldom been given with a criminal intention, owing to their acrid taste, unless with the view of producing abortion, and with this object the *sulphate* has been often taken. Poisoning by them is most frequently the result of accident. When swallowed in the largest quantities they sometimes occasion the least serious effects, owing to their instant rejection by vomiting. They nevertheless often produce, either most *acute* and virulent poisoning, or effects which are more slowly developed, thereby occasioning a *chronic* form of poisoning. Even in the most acute or rapid cases, the lesions they produce on the digestive canal may be the least remarkable, whilst in the slow or chronic form these lesions may be severe.

206. *a.* The *symptoms*, as respects the digestive organs, are nearly the same as in other instances of corrosive poisoning; but the vomiting is most rapid and copious, and the rejected matters present a remarkably *blue* or *green colour*, sometimes with minute or broken crystals of the salt. Abdominal pain is acute, and is attended by diarrhœa, extreme anxiety, and spasms of the extremities. *Jaundice* is sometimes met with, — a symptom rarely observed in other cases of acute or corrosive poisoning. Stupor, coma, insensibility, convulsions, and sometimes paralysis supervene early, and terminate life in periods varying from three or four hours to several days. In the more *chronic* states, these symptoms are developed and proceed more slowly; the discharges present a greenish hue, especially if verdigris have been taken, and the salt may be detected in them. The digestive canal evinces the most severe disorder: vomiting coppery eructations, salivation, diarrhœa, tenesmus, dysuria or suppression of urine, cramps, convulsions, prostration of strength, &c. continuing for several days, or until death or recovery takes place.

207. *b.* On *Dissection*, of the chronic cases especially, evidences of inflammation, in various parts of the digestive canal, have been found, generally attended by softening, tumefaction, ulceration, and more rarely with perforation of all the coats of the tube. These lesions are often more remarkable in the intestines than in the stomach. The digestive villous membrane presents a green colour, or even minute particles of the poison. These lesions are not constant; but the nervous system betrays, in the great majority of instances, marked functional disorder. Therefore poisoning with the salts or oxides of copper will be further considered under the Class, *Acro-sedative Poisons.*

208. *c. Treatment.* — The *chemical antidotes* for the cupreous preparations have been stated by Dr. Pereira to be the whites of eggs, given abundantly, or whatever may contain most *albumen.* In the absence of eggs, milk or wheaten

flour should be employed. *Iron filings* have been proposed by NAVIER, PAYEN, and CHEVALIER, and subsequently by DUMAS and EDWARDS; the iron decomposing the cupreous salt, and precipitating the copper in the metallic and inert state. The *ferrocyanide of potassium* is also said to be a good antidote; a drachm or two of it may be taken with safety. *Sugar* was proposed by M. DUVAL: its efficacy, although denied by ORFILA and VOGEL, has been recently contended for by POSTEL. (PEREIRA, *Mat. Med.*, vol. i. p. 776.)

209. The efforts of the stomach should, however, be promoted in order to procure the discharge of the poison; and, with this view, the whites of raw eggs, milk, warm mucilaginous drinks, &c. should be given frequently and liberally, and, as well as starch, administered as enemata. The stomach-pump may be of service in some instances; but, when vomiting follows freely and abundantly the ingestion of these draughts, it may be more injurious than beneficial. Inflammatory symptoms should be combatted in the usual way, according to their severity and the peculiarities of the case. The nervous symptoms require a recourse to external derivatives, and the other means which will be mentioned in the sequel, (*See* CLASS, *Acro-sedatives.*)

210. *d.* In the more *chronic* cases of poisoning, with the cupreous compounds, opiates in full doses, with or without creasote and camphor may be given in demulcent vehicles: or the syrup of poppies may be similarly exhibited or administered in enemata, and be aided by warm baths and external derivatives; but these means should not be resorted to until the poison has been evacuated from the stomach and bowels.

211. *D.* GOLD — *Hydrochlorate of — Chloride of — Iodide of Gold* — and some other preparations of this metal have been recently employed in medicine, especially on the Continent, and may, from accident or otherwise, occasion poisoning. — *a.* Dr. CHRISTISON states that the poisonous properties of the *chloride* are powerful, and closely allied to those of the hydrochlorates of tin and nitrate of silver. The chloride of gold occasions death in three or four minutes when *injected into the veins*, even in very minute quantities, and the lungs are found after death so gorged with blood as to sink in water. (ORFILA, *Toxicol. Génér.* t. i. p. 593.)

212. *b.* If the chloride of gold be *swallowed*, corrosion of the digestive canal takes place; and the salt is so rapidly decomposed that none is taken up by the absorbents; and death ensues from the local injury solely. Even in doses so small as a tenth of a grain, it has caused much irritation of the stomach. The form of fulminating gold has produced alarming poisoning, where it was used in medicine. PLENCK says that it excites griping, diarrhœa, vomiting, convulsions, fainting, salivation, and sometimes even occasions death. HOFFMANN repeatedly saw it prove fatal, the most prominent symptoms being vomiting, great anxiety and fainting. In one of the cases the dose was only six grains.

213. *c. Treatment.* The *antidotes* for the preparations of gold are the same as those found most successful for poisoning by corrosive sublimate, especially the whites of raw eggs, or *albumen*, large draughts of *milk*, &c. The gastro-enteric symptoms should be removed by vascular depletions, derivatives, emollient enemata, warm baths, opiates, &c.

214. *E.* IRON. — None of the preparations of iron fall under the class of corrosive or caustic poisons, unless the *tincture of the sesqui-chloride*, and it owes its injurious operation, when taken in large quantities, to the excess of acid, the *symptoms* and *lesions* produced by it being the same as those occasioned by *hydro-chloric acid* (§ 150.)

215. *F.* MERCURY. — *The preparations* of this metal often cause poisoning, which may be either *acute and rapid*, or *chronic* or *slow*, according to the quantity taken, to the repetition of the doses, and to the modes of employing them. In large doses, the more active of these preparations act rapidly, and are corrosive and acute poisons; but, in small or repeated doses, their effects are chronic or slow, and they act as *acro-alterative poisons*, in which *class* I shall consider this mode of their operation, in connection with that of some other preparations of mercury. It is thus chiefly the *acute* or *corrosive action* of these preparations which I have here to consider: the *chronic*, or consecutive effects, will fall under the class just referred to.

216. *a.* The *bi-chloride of mercury — corrosive sublimate.* — The poisonous operation of this substance has been ably investigated by ORFILA, CHRISTISON, PEREIRA, DEVERGIE, BECK, TAYLOR, and others. The *symptoms* caused by a large dose of the bichloride appear either immediately, or in a very few minutes after having been swallowed. A coppery, or metallic taste, is felt in the mouth, and if the poison be in a state of solution, sensations of remarkable acridity, burning constriction, and corrosion are felt in the mouth, fauces, and pharynx, descending to the stomach; where, in whatever state it may have been taken, pain is very soon occasioned by it; is increased on pressure, and is followed by nausea and vomiting; the matters thrown up consisting of the alimentary articles remaining in the stomach, and afterwards of stringy masses of white mucus, streaked or mixed with blood. To these supervene difficult deglutition, the rejection of whatever is taken into the stomach; sometimes a sense of strangulation or suffocation; the extension of pain over the abdomen, and intolerance of pressure; violent purging, and lacerating pains of the bowels, followed by tenesmus and mucous and bloody stools; anxiety, restlessness, and short or laborious respiration; a quick, small, and contracted pulse; burning thirst, and a white, dry, constricted state of the tongue and mouth; anxious expression of countenance, at first with flushing, subsequently with collapse and twitchings of the muscles of the face; suppression of urine or dysuria; cold sweats, great debility and sinking; sometimes ptyalism; sinking and irregularity of the pulse; and coldness of the extremities. Death is often preceded by stupor, insensibility, convulsions, or twitchings of the limbs, or even by paraplegia.

217. Poisoning by this substance *differs* from that produced by *Arsenic:* 1st, The well-marked taste, and the acridity and irritation of the throat and œsophagus, produced by the former, are much greater than by the latter: — 2nd, The symptoms are more violent and immediate upon the ingestion of this poison, than after arsenic: — 3rd, The evacuations are oftener mixed with blood, and irritation of the urinary organs, or sup-

pression of urine, is more frequent, than after poisoning with arsenic. The symptoms caused by corrosive sublimate resemble, in the most acute cases, and at the commencement, an attack of common *cholera*; subsequently, when the patient survives two or three days, they resemble those of *dysentery*, especially as respects the existence of tenesmus, and of mucous and bloody stools; and when ptyalism, or affection of the salivary glands, is not present.

218. *b. Appearances after death.* — These are confined chiefly to the digestive canal. The mucous membrane of the throat and œsophagus, and sometimes also of the mouth and fauces, is softened, and of a whitish or bluish grey colour; that of the œsophagus, especially near the cardia, is partially corroded. The villous surface of the stomach often presents a slate-grey or greyish tint, arising from the action of the poison, as supposed, upon this surface during life. Underneath, the tissues are more or less inflamed, sometimes in patches, and large black ecchymoses, or extravasations of blood are often found underneath the villous membrane. In rarer cases this membrane is only simply inflamed. The coats of the stomach are corroded, discoloured more or less, and often softened so as not to admit of removal without laceration. Perforation, however, is very rare. Similar changes to the above are met with in the small intestines, and in the large bowels, especially in the sigmoid flexure of the colon and rectum; but not to so great extent as in the stomach, although sloughing ulcers are more frequently met with in these latter situations. The colon is generally very much contracted. In cases which have not been very rapidly fatal, sloughing ulceration, dark discolouring of the ulcers or in their vicinity, and softening, are met with in several parts of the digestive canal. Various alterations of the urinary organs are occasionally observed; but these are neither constant nor uniform, with the exception of contraction of the urinary bladder, which is always observed. The epiglottis and trachea are sometimes inflamed; and the endocardium often presents indications of inflammation. The coats of the stomach and intestines and the collatitious viscera often yield mercury on analysis. Poisoning by this substance does not delay the accession or progress of decomposition, as observed in respect of poisoning by arsenic.

219. *c. The quantity which may destroy life* varies greatly with the circumstances adduced above (§ 51, *et seq.*). The *smallest* quantity instanced by Mr. Taylor is *three grains*, this having been given to a child, by mistake, for calomel; but he believes that *two* or not more than *three grains* have proved fatal in an adult. If this quantity — even two grains — be taken at once on an empty stomach, I do not doubt that it is capable of producing a fatal result, if medical aid be not procured; but I state this chiefly from much experience of the medicinal exhibition and properties of this substance. When this poison has been taken on a full stomach, or when free vomiting has followed the ingestion of it, or when medical treatment was not long delayed, very large quantities have failed to produce death. A case is recorded by Dr. Booth (*Med. Gaz.*, vol. xiv. p. 63.), in which *an ounce* was taken, and, owing to these favourable circumstances, recovery was effected.

220. *d. The period at which death takes place* varies, in the *acute cases*, from two or three hours to five or six days. Mr. Illingworth (*Med. Gaz.*, vol. xxxi. p. 557.) met with an instance of death from the sublimate in from two to three hours. Death from this substance in from ten to twenty-four hours is common; but life may be prolonged for several, or even many days, although the dose of the poison has been very large, when medical aid has been soon obtained. In these, the symptoms of *slow*, or *chronic poisoning* have generally appeared; and the effects — ptyalism, diarrhœa, tenesmus, &c. — described in connection with the *acro-alterative* action of this and other preparations of mercury, have usually been observed. *Acute* poisoning by this substance is the result of the chemical action, and the destruction of the tissues caused by the contact of it. The fatal issue is produced by the extent of lesion of the digestive canal, aided by the shock to vital power and nervous energy. Whatever absorption may occur, in the circumstances more favourable to this mode of operations, and in the more prolonged cases will further aid this issue, owing to the injurious influence which an excessive amount of the poison in the circulation will exert upon the heart and nervous masses.

221. *e. The treatment of acute poisoning* by corrosive sublimate consists of the *removal* of the poison, of the administration of *antidotes*, and the counteraction and removal of the effects produced. — (*a*) The *removal* of the poison from the stomach is best procured by the encouragement of vomiting by means of copious draughts of fluids containing, or consisting of, the antidotes about to be noticed. Mr. Taylor states that, "if vomiting do not already exist, it must be promoted by the exhibition of emetics." But it may be urged against this advice, that the circumstances are rare which admit of emetics; for they may increase the mischief in the stomach, or otherwise complicate the case; or time may be lost in waiting for their operation, which may not soon take place, unless they are of an energetic kind. A recourse to the stomach-pump is liable to the objection already urged against it, in cases where the œsophagus and stomach are constricted, corroded, or softened by the poison (§ 174.). Swayed by these considerations, I advise an immediate recourse to such draughts as are most likely to promote vomiting and thereby the rejection of the poison, and to convey at the same time the *antidote* which may be obtained with the least delay.

222. (*b.*) The *antidotes* are chiefly those which more or less efficiently decompose the corrosive sublimate: these are *albumen*, the *gluten* of wheat, *milk*, *iron filings*, and *meconic acid*. — *a. Albumen* appears to decompose the sublimate so as to render it almost inert. — Dr. Christison has adduced several cases proving the remarkable efficacy of this antidote. The celebrated Baron Thenard swallowed inadvertently a concentrated solution of corrosive sublimate; but by the immediate and abundant use of the whites of eggs, he suffered no material harm. Raw eggs — both the whites and the yolk — should be taken most abundantly, and ought not to be

withheld, even although the poison has been taken for a considerable time; for this antidote is often efficacious notwithstanding, and is the one most to be depended upon. Peschier states that one egg is sufficient for every four grains of the poison; but no harm can result from taking many, as they will be thrown off by vomiting; indeed they should be so given as to promote vomiting.

223. *β. Gluten* has also been recommended by Professor Taddei. It may be prepared by washing flour in a muslin bag, under a current of water; but it will be preferable, when albumen cannot be procured, to mix flour in water, and give it in abundance: it will thus often promote vomiting (§ 221.), and act as an antidote. *Milk*, in the absence of albumen or flour, may be likewise given, or *gum-water*, *linseed tea*, or sweetened water. *Iron filings* are stated to be useful, by reducing the sublimate to the metallic state. *Meconic acid* is also said to be an antidote, by forming an insoluble meconate of mercury. But, as Dr. Pereira justly remarks, a knowledge of this fact is of little practical value, since the acid is not generally procurable; and tincture of opium, which contains it, cannot safely be used in sufficient quantity; for Dr. Christison finds that five grains of corrosive sublimate require an infusion of thirty-three grains of opium to precipitate the whole of the mercury. Mr. Taylor states, that the *protochloride* of tin, in the proportion of one part to fifteen parts of water has been recently proposed by M. Poumet as an antidote. But the efficacy of this substance has not been sufficiently tested in the human subject. These antidotes, even albumen, cannot be expected always to be successful. The sooner they are given the greater is the chance of success. Several instances, however, have been recorded of their failure, owing either to delay in their exhibition, or to the perfect solution and quantity of the poison, or to other circumstances of the case. Hence it will always be proper to exhibit the antidotes, as already advised (§ 222.), especially the eggs, in large number, and in the way most likely to promote vomiting.

224. (*c.*) The *effects* produced by the poison as far as these are indicated should next attract the attention of the physician. These approach, in some cases, to the more common forms of gastro-enteritis, or of dysentery, or even of peritonitis; but the vascular action is generally less sthenic than in those, owing to the extent and severity of the injury sustained by the villous membrane and nerves of the digestive canal, and hence vascular depletions cannot be carried to the same extent as in these diseases. They are, however, generally required, most frequently locally by leeches, rarely by venæsection, or by both modes in the same case. Demulcents with opiates should be freely administered, and emollient and anodyne enemata be thrown up. Fomentations, rubefacient embrocations, &c., ought to be applied to the abdomen, and frequently renewed; and warm baths resorted to occasionally.

225. (*d.*) The *diet*, as recovery advances, should consist chiefly of farinaceous articles, of light panada, gruel, demulcent drinks, milk, rice-milk, or creams, and broths made of the flesh of young animals, and flannels ought to be worn nearest the skin.

226. *f.* The *nitrates of mercury* are corrosive poisons. They are easily dissolved in water, especially if there be a little excess of acid present. Mr. Bigsley has recorded (*Med. Gaz.* vol. vi. p. 329.) the case of a boy who dissolved some mercury in strong nitric acid, and swallowed about a tea-spoonful of the solution. He was instantly seized with excruciating pain in the pharynx, œsophagus, and stomach; urgent anxiety, cold skin, small pulse, colic, and purging. He sank rapidly, and died in about two hours and a half. The fauces, œsophagus, and stomach were found after death corroded and inflamed. The *treatment* is the same for poisoning by these salts as for that by corrosive sublimate. The diluted proto-chloride of tin is suggested as an antidote by Mr. Taylor.

227. *g. Bicyanide of mercury* is a most active corrosive poison. A person swallowed twenty-three grains of this substance, and was immediately attacked with all the symptoms characterising the ingestion of corrosive sublimate; and, on *inspection* after death, the same lesions of the digestive canal were observed. The *treatment* is also the same as that already recommended for poisoning by the sublimate.

228. *h. White precipitate*—the ammonio-chloride of mercury; *red precipitate* — the red oxide of mercury; *turbith mineral* — the subsulphate of peroxide of mercury; *cinnabar* and *vermilion* — the persulphuret of mercury; and *calomel* — the chloride of mercury, are severally acrid poisons, in very large or repeated doses, and may even corrode the digestive canal; but their effects are uncertain as respects this mode of action, and therefore they will be more appropriately considered hereafter; when also poisoning by the external use of mercurial preparations, and by other modes of employing them, will be noticed.

229. *G.* Silver—*Nitrate of* — *Lunar caustic* — is a powerful corrosive poison, when employed in substance or in strong solutions. It rapidly combines with, and is ultimately decomposed by the tissues; the acid corroding them. It is, in these states, a local and disorganising agent, and is not absorbed unless it be employed in small and frequent doses. There are very few cases of poisoning by it on record, and these have not been detailed with any precision. — *a.* The *symptoms* produced by this poison are most probably but little different from those caused by several other corrosive poisons; but, judging from its effects in large medicinal doses, diarrhœa is most probably not occasioned by it.

230. *b. Treatment.* — The *antidote* for nitrate of silver is common salt, which, acting upon the nitrate, forms nitrate of soda, and chloride of silver, which is innocuous. The contents of the stomach should be removed, and the symptoms alleviated, by demulcents, opium, external derivatives, and local bleedings; by emollients containing salt, and by anodyne enemata.

231. *H.* Tin — *the chlorides or muriates of.* — A mixture of these is extensively used in the arts, and may hence produce accidental poisoning; but instances of such an occurrence are extremely rare. They appear to act as local corrosive poisons when taken in large quantity, and to occasion the usual symptoms of this class of poisons. They are decomposed by many organic substances, and then the *treatment* of poisoning

by them should consist of the liberal and frequent ingestion of albumen, milk, and demulcents; and, after the stomach has been completely evacuated, of the administration of opium, emollient enemata, &c.

232. *I.* Zinc — *Chloride of* — *a.* This substance, now employed as an antiseptic, when taken into the stomach, or applied to any living tissue, in states of strong solution, is a powerful caustic, or corrosive poson. It may be inferred to produce the usual *symptoms* of corrosive poisons, as I am not aware of an instance of poisoning having been caused by it; and its effects may be *treated* by the administration of the carbonate of soda, or any of the alkaline carbonates, with albumen, demulcents, and other means already recommended for caustic and corrosive poisons.

233. *b. Sulphate of Zinc — white vitriol* — has been considered as a corrosive poison; but its corrosive and local action is very rarely so great as to occasion death, even when given in very large quantity, for it is generally immediately thrown off the stomach, and occasions merely an irritant and astringent action; and, with reference to this action, it will be considered in the *third class* of poisons.

234. ix. Vegetable Acrids. — There are numerous vegetable productions which produce poisonous, or at least injurious effects, when taken into the stomach; or, when applied externally, or otherwise employed. Many of these act chiefly locally, inflaming and corroding the tissues; whilst others produce less local irritation, but are absorbed to a greater or less extent, acting thus remotely and injuriously upon the nervous centres and on vital organs. Under this class, I shall very briefly notice such of the vegetable poisons as act chiefly on the digestive villous surface, when swallowed, and locally as respects the parts to which they may be applied.

235. *a. Anemone nemorosa — A. pratensis — A. Pulsatilla*, and *A. sylvestris* — are severally very acrid poisons. Bulliard states, that an old man with rheumatic gout, applied the bruised root of *A. Pulsatilla* to the calf of his leg, on going to bed; violent suffering, with sphacclation of the part ensued. Animals have exhibited marks of intense inflammation of the stomach and rectum, after having swallowed it. *A. nemorosa* is said to produce dysentery in sheep. The inhabitants of Kamschatka make use of this plant to poison their arrows. Robert and Vauquelin extracted a fluid of an acrid taste and pungent odour from the flowers of the *A. pratensis*, which acted like a caustic on the tongue.

236. *b. Arum maculatum — Wake-robin — A. Dracunculus*, and other species of arum are acrid poisons, in the recent state, and when not acted upon by heat. They occasion a burning pain and swelling in the throat; difficult and painful deglutition. Bulliard states that three children, who ate of the leaves of the *A. maculatum* were thus affected, and experienced horrible convulsions. Two of the three died after some days. The *Calla palustris* — or *Water Arum* — excites a similar action to the above.

237. *c. Bryonia dioica — Bryony.* — The root of this plant occasions vomiting, violent pain, profuse alvine evacuations, and faintings. Pyl mentions a fatal case from taking two glasses of an infusion of the root to cure an ague. Tormina and purging soon supervened and killed the patient. It occasions violent inflammation in the large and small intestines, and of the stomach. Brandes imputes the acrimony of the plant to a principle which he has called *bryonine*, which induces intense inflammation of the parts to which it is applied.

238. *d. Caltha palustris — Marsh Marygold* — has been noticed by several writers as an acrid poison, inflaming the œsophagus, stomach, and bowels, even of the lower animals. A family of five persons in Germany, after partaking of it, were all seized, in half an hour, with pain in the stomach, sickness, vomiting, diarrhœa, and dysuria; and, on the following day, with a general swelling of the body, and a copious eruption. They, however, all recovered. In addition to the inflammatory action produced by it in the digestive canal, it appears to be absorbed, and to occasion general vascular excitement, and irritation of the urinary organs and skin.

239. *e. Chelidonium majus — Celandine* — has a bitter and acrid taste; and causes inflammation of whatever parts to which it may be applied. When taken into the stomach it inflames the digestive mucous surface, and is partially absorbed; exciting the brain and nervous system; and causing congestion of the lungs. These latter effects, especially that on the brain, is more remarkably produced by *C. Glaucium.* — *Clematis Vitalba* — (*Virgin's bower*) — *C. Flammula* — *C. erecta* — *C. integrifolia* — are all acrid and caustic. When applied to the skin, they produce redness, pustules and excoriations. Stoerck and Mueller prescribed them in some chronic affections, especially syphilis, rheumatism, and scrofula, in small doses, in the form of infusion; continuing their use for some weeks with alleged benefit. M. Roques states that they occasion dysentery in animals. The powder of the leaves, in doses of one, two, or three grains, have also been employed. They are exciting, diaphoretic, and alterative in small doses; but, in large doses, they destroy life by the intense inflammation they produce in the whole course of the digestive canal.

240. *f. Croton Tiglium — Purging Croton.* — The seeds of this plant have a burning, acrid, and nauseous taste. They were formerly employed as a hydragogue-purgative; but, on account of the violence of their operation, were laid aside. One seed is sufficient for a dose, and even sometimes excites violent vomiting and purging. More recently the *expressed oil* of this plant has come into use. Dr. Pereira met with a case of poisoning by inhalation of the dust of the seeds. The patient had been employed for several hours in emptying packages of the seeds. He complained of loss of appetite, of a burning sensation in the nose and mouth, followed by pain at the epigastrum, and copious lachrymation. He became giddy and insensible, but recovered. His bowels were not affected.

241. The oil causes rubefaction and a vesicular or pustular eruption when rubbed on the skin; and when rubbed on the abdomen, it often purges. When swallowed in one or two drops, it produces a burning acrid taste in the mouth and throat, and acts as a drastic purge, procuring watery motions, and sometimes an increased secretion of urine. It appears to be partially absorbed; but it evidently acts as a sedative irritant of the digestive

mucous surface. The only case of poisoning which is known to have been caused by it, was that of a young man, ill of typhoid fever, who took by mistake two and a half drachms of the oil. Three quarters of an hour afterwards the skin was cold, and covered with a cold sweat; the action of the heart and pulse were scarcely perceptible; the respiration difficult, and the extremities blue. An hour and a half afterwards, there were excessive involuntary alvine evacuations, but no vomiting; the abdomen was tender to the touch; and a burning sensation was felt in the œsophagus. The blueness extended over the body; the surface became insensible, and death took place after four hours. This oil, even in the usual purging dose, sometimes acts violently, generally speedily, although not certainly, occasioning much depression of the vascular system, and a feeling of debility.

242. *g. Cucumis Colocynthis.— Bitter Apple.*— The spongy or medullary part of the fruit is a drastic cathartic, causing inflammation of the villous surface of the bowels, and bloody evacuations. This substance has caused death in several instances owing to mistake. A woman swallowed a tea-spoonful and a half of colocynth powder, and died in twenty-four hours. A person took two glasses of a decoction of colocynth, and died in a short time. Vauquelin discovered the active principle of this plant, and called it *colocynthin*.

243. The *symptoms* are, at first, frequent albine evacuations; great heat and colicky pains in the bowels; dryness of the throat, and unquenchable thirst; a small and rapid pulse; redness of the tongue; a fixed pain around the umbilicus, and tenderness. To these succeed coldness of the extremities, cramps, sinking of the powers of life and death. On *dissection* the whole digestive canal exhibits marks of inflammation, which is often most intense in the stomach and large bowels, the villous membrane of which is abraded, readily detached, or even ulcerated. The intestines are studded with black spots or ecchymoses; the inflammation sometimes extends through all the coats; the peritoneum being inflamed, and either adherent to its opposite surfaces, or covered by a false membrane, or containing a whitish fluid and florenti.

244. *h. Cyclamen europæum* is a violent irritant, exciting vomiting and purging. Bulliard states that its root produces cold sweats, dizziness, and convulsions; the patient voids blood both by vomiting and by stool, the super-purgation and inflammation proving even fatal.

245. *i. Daphne Gnidium* (*Spurge-flax — Flax-leaved Daphne*)—*D. Mezereum* (*Mezereon*).—The bark of these plants acts as a corrosive poison when applied to living tissues. I have frequently employed the mezereon bark as an external irritant, instead of caustic alkali, in forming an issue. When swallowed, it inflames the digestive canal, causing heat and dryness of the throat; salivation, abdominal pains, frequent vomitings, bloody stools, giddiness, and feebleness of the limbs; and the lesions above described (§ 243.). The *Daphne Laureola* is also poisonous, and produces nearly the same effects as the other species.

246. *k. Delphinium Staphisagria—Stavesacre—Palmated Larkspur — D. tricorne.* — The acrid property of these plants is lodged in the alkaloid, which Lassaigne and Fenuelle discovered in them, and which is an extremely acrid irritant. The local effects of these plants are evidently the most striking. They have been found to inflame intensely the digestive mucous surface, when swallowed, but not to produce any alteration of other organs.

247. *l. Euphorbia officinarum.*—The stalk of the various species of the genus Euphorbia furnishes a milky juice, which, on being dried, is called *euphorbium*. It is a gum-resin, which contains an active principle, styled *euphorbin*. A tea-spoonful of the gum-resin was administered by mistake; and it occasioned a burning sensation in the fauces and throat, rapidly extending to the stomach, and causing incessant watery vomitings. The pulse became remarkably rapid and irregular; a cold perspiration broke out, and death took place after two days. The body was inspected eight hours after death; the coats of the stomach could be torn with the greatest ease; the internal surface of the viscus was studded with gangrenous spots; the spleen was enlarged and much softened, and the inner coat of the aorta was beautifully injected with blood, and highly inflamed. The after lesion was probably caused by the partial absorption of the poison in this case.

248. Many of the *species* of the genus *Euphorbia* are poisonous, as the *antiquorum, canariensis, Tirucalli, Peplus, helioscopia, verrucosa, platyphyllos, palustris, hibernica, amygdaloides, sylvatica, exigua, mauritanica, neriifolia, Esula, heptagona*, &c., and have been employed in poisoning spears, arrows, &c. The species *Lathyris* and *Cyparissias* are said by Lamotte to have proved fatal when administered in a *glyster*. A person allowed his closed eyelids to be rubbed with the juice of the *E. Esula:* inflammation took place, and it was followed by the loss of the eye. A boy, six years old, ate some of the *E. Peplus*. It produced vomiting, purging, spasms, a weak small pulse, inability to swallow, insensibility, cold extremities, and death. *On dissection*, the tonsils, fauces, and pharynx were seen very much inflamed. The villous membrane of the stomach and small intestines were very red; but that of the large intestines much less so. The urinary bladder was very contracted. The epiglottis and larynx were highly inflamed. The lungs were healthy. The veins of the dura mater were congested. The blood was fluid. The brain was healthy.

249. *m. Gratiola officinalis — Hedge Hyssop* — acts chiefly locally, causing inflammation of the part which it touches. It has produced death rapidly when an extract of it was injected into the veins.

250. *n. Hippomane Mancinella—Manchineel tree.* —The wood of this tree, when green, excites inflammation of the skin when rubbed against it. The dust of the wood is so acrid as to excite inflammation of the respiratory passages, or asphyxia, when inhaled with the air. Dr. R. Madianna found that the juice excited inflammation when applied even to the sound skin. Orfila and Ollivier applied this juice to a wound in the cellular tissue, with a fatal result. When given internally, it soon destroyed life; the stomach and intestines being found, on dissection, very highly inflamed.

251. *o. Jatropha Curcas — Indian nut.* — The seeds of this plant are a violent poison, exciting incessant vomitings, purging, severe pain, vital depression, and death. Its fatal effects are more rapid when it is taken into the stomach than when

introduced into the cellular tissue. When swallowed, it produces intense inflammation of the digestive canal. Mr. BENNETT states that it is used as a purgative by the natives of the Philippine Islands, an over-dose producing intense pain, vomiting, and purging; their only antidote being large draughts of cold water.

252. *p. Juniperus Sabina—Savine.*—The leaves and tops of this plant contain an acrid poison, in the form of a volatile oil of a remarkable odour. They are acrid and irritant in the state either of infusion, powder, or tincture, and yield a light yellow oil, in which the active properties of the plant chiefly reside. The powder, or the infusion, or the oil, has been often taken, in excessive doses, in order to procure abortion — the power of accomplishing which effect it does not possess more than any other violent irritant. When em ployed with this intention, it not unfrequently de stroys the life of the mother, and sometimes ev before an abortion is procured. Mr. TAYL states that, in a case in which the savine pow was taken with a fatal issue, he found a gr fluid in the stomach, which, with the œsopha and small intestines, was highly inflamed. poison was identified by placing the minute tions of the leaves found in the stomach un powerful microscope. A girl, to procure ab took a strong infusion of savine leaves, whic duced violent pain in the abdomen and stra She miscarried two days afterwards, a four days after that. On *dissection*, e peritoneal inflammation was found. Th of the stomach was very red, and cheque patches of florid extravasation (CHRIST *Lat.*). Whilst this substance acts locally partially absorbed; and, through the m the blood and urine, affects the urinary

253. *q. Momordica Elaterium—Wild c Cucumber.*—The fecula deposited by th juice of the fruit of this plant — *elater* tains the active principle to which th of the plant are imputed, and are c altogether owing. Drs. CLUTTERB MORRIES, and PEREIRA have examin and found that its active principle *momordicine* — which is soluble in very active purgative in the dose of of a grain. Elaterium — the fecu of the fruit — when of the best qu and hydragogue purgative in the twelfth of a grain. Its acridity i flames and ulcerates the fingers pare it. Although acting thus local irritant, it appears also sorbed; and even to have its ir mitted by means of the nervo more or less remote. When t it produces violent hypocathar watery stools; being the m gogue purgative known. F grain of the purest kinds of el this effect and procure the pints of fluid by the bowels. sions not merely violent gr domen, but also increased dry tongue, great thirst, a ness of the skin. A femal a quack, in divided doses of elaterium and sixte duced incessant vomiti

Others produce not merely more or less inflammation and excoriation, but also other functional and organic changes, which rank them in the classes which follow.

259. *y.* 1st. The *action* of the acrid vegetables is generally exerted upon the tissues with which they come in contact, in which they occasion inflammation, excoriation, or corrosion, ulceration, or sphacelation, with the symptoms usually attending these lesions, according to the parts in which they are produced. 2nd. The fatal effects of these poisons are more certainly developed when they are taken into the stomach, than when applied externally, or introduced into the cellular tissue: for, in the former case, they affect a greater extent of surface, having an intimate connexion with the organic class of nerves, and, through these nerves, developing a wider range of morbid sympathies than in the latter. 3rd. Some of these poisons, in addition to these local effects, are partially absorbed, and produce changes either functional or structural — nervous or vascular — in other remote organs, as the lungs, the urinary organs, the nervous masses, &c.

260. *z.* The *treatment* of the vegetable acrids consists chiefly of the expulsion of them by encouraging vomiting, by means of mucilaginous draughts; and of allaying irritation by opiates, external derivatives, emollient and anodyne enemata, and local depletions. Opium may be given in full or frequent doses, and rubefacient embrocations or fomentations assiduously applied over the abdomen. I have found the turpentine fomentations, opiates, starch enemata, with the compound tincture of camphor or syrup of poppies, the most generally efficacious; and, if vital depression supervene, camphor, ammonia, decoction of cinchona, or aromatic infusions are the most serviceable. During recovery the *diet* and *regimen* advised during convalescence from the effects of several corrosive poisons should be adopted, (§§ 157. 174.).

261. Class II. Depressing and Paralysing Poisons — Sedative Poisons. — There are several agents which destroy life by the extent to which they abstract the vital caloric, depress the nervous energy, and lower the action of the heart and vascular system generally. In virtue of these modes of operation, they destroy vitality without any very obvious pre-existent excitement, and without producing either the appearances or the symptoms or lesions attending local irritation. The effects of these agents are manifested by the states of function and of vital manifestation and action, and by no further lesion than may be attributed to failure or loss of function or action — by the absence of such structural changes as are calculated to account for death, conformably with our acquaintance with the extent and consequences of pathological conditions. Of this mode in which certain poisons act, I have already taken a general view (§§ 28—30). I shall therefore notice, as briefly as possible, those agents which come under this class — which destroy life by acting in this way, and independently of such structural lesions as are of themselves calculated to produce the result. It may, however, be here remarked, that there are numerous substances, which, in addition to more or less manifest lesions of structure produced by them, act also as sedatives or depressants of nervous energy and vital action, which produce more complicated effects or associated results, and which thereby constitute other classes of poisons, more especially the *fifth class.*

262. *A.* Acetic Acid, in various states of concentration or purity, may be so employed as to act as a sedative. It has been considered above (§ 125.), with reference to its corrosive operation, or to its employment in larger doses, and in states of strong concentration. But when taken in states of dilution, and when the use of it is continued for a considerable time, it acts not only as a sedative, but also as a slow poison. These effects depend, in some degree, on constitution and the quantity of it usually taken; for, in moderate doses, both it and the *mineral acids* are tonics and refrigerants, and increase the appetite, whilst, in larger doses, or when too long continued, they impair or otherwise affect the assimilating processes, and even change the constitution of the blood. When very dilute acetic acid is taken, especially during vascular excitement, or in febrile states, it allays thirst, lowers the heat of surface, and increases the urine. It is certainly absorbed to a greater or less extent; and, both locally and through the medium of the circulation, it exerts some degree of astringent action. I have met with several instances of disorder from the protracted use of this acid, amounting nearly, and, in one quite to that observed in the following case: — A young lady enjoyed good health, was plump, had a good appetite, but was afraid of becoming too fat. She was advised to drink a small glass of vinegar daily: she did so, and her plumpness diminished; but, after some weeks, she began to complain of a short dry cough; her body became lean and wasted; her breathing short and difficult, and the usual symptoms of tubercular consumption supervened. On *dissection* all the lobes of the lungs were studded with tubercles. The long continued use of acetic acid seems to favour the development of several organic changes which originate in debility. Morgagni believed that it favoured the production of schirrus of the pylorus.

263. *B.* Acids — The Mineral. — The action of these acids in large quantities, and in strong and concentrated states, has been already considered (§ 132. *et seq.*); in which states they act locally and as corrosives. But in states of weak dilution, they operate differently, their effects varying with the quantity and continuance of the use of them. Many years ago I made a series of experiments with these acids in different states of dilution, and for various periods; and most of them were made upon myself. I found, — 1st, That the *sulphuric*, the *nitric*, and the *hydrochloric acids*, were severally absorbed into the circulation when taken in states of dilution short of producing corrosive effects; — 2d, That, after periods varying with the amount and frequency of the dose, and with the acid taken, the presence of the free acid could be detected more or less abundantly in the urine; — 3d, That sulphuric acid appeared sooner in the urine than the nitric or hydrochloric, and that the nitric required the longest time to appear, and the largest doses; but as to this particular, I was not quite satisfied; — 4th, That the sulphuric acid evinced the most decided refrigerant and sedative action, especially when much diluted; — 5th, That the use of these

acids was at first tonic and refreshing, and to some extent astringent and diuretic; but that, when continued for some time, and when they were more abundantly absorbed, especially the sulphuric, they then were depressing; occasioning indigestion, weakness of the pulse, and in my own case, after the sulphuric acid had been taken some time, intermissions of the pulse, and impaired impulse of the heart, the urine at this time containing free sulphuric acid, or this acid in excess; — 6th, That a too long continuance of these acids, particularly of the sulphuric, not only impaired digestion and assimilation, but also weakened the heart's action, lowered irritability, caused emaciation, disordering the bowels, and the secretions poured into the digestive canal; — 7th, That these acids act as refrigerant tonics only when employed for a short time in such quantity as may render drinks agreeably acid; that they are most beneficially prescribed in this manner, in order to remove a particular diathesis or specific condition; and that they are slow poisons when long continued in healthy states of the frame, the good effects often imputed to them resulting either from other causes, or from vital resistance and the efforts of nature; — 8th, They affect when continued for some time the constitution of the blood; — 9th, The mineral acids when thus employed are excreted from the blood chiefly by the kidneys and the skin.

264. *C.* ALKALIES AND THEIR CARBONATES when taken in states of weak solution, or continued for too long a time, or in doses short of producing the effects described above (§ 167. *et seq.*), impair more or less remarkably vital power and vascular action. These substances are readily absorbed into the circulation, whence they are eliminated chiefly by the kidneys, and slightly by the skin. The prolonged use of them may occasion slow or chronic poisoning, owing to the effects produced by them on the digestive mucous surface, and on the urinary organs; for they manifestly favour the too rapid detachment or exfoliation of the epithelium covering the villous and mucous membranes of these viscera, whilst they alter the constitution of the blood, and affect the healthy states of the hæmato-globulin. When thus improperly employed, their operation as sedatives tends rather to favour the origin and development of organic lesions and chronic diseases, which may ultimately terminate life, than to cause death in a more direct and immediate manner.

265. *D.* COLD.—The *abstraction of animal heat* — may, from its intensity or continuance, destroy life. Cold is a powerful sedative, benumbing the sensibility, weakening muscular motion, and lowering vascular action. It also favours internal congestions, especially of the lungs, brain, and liver, and ultimately of the large veins and right side of the heart; these congestions, increasing the effects of cold on the sensibility and on the vascular system to a fatal amount, unless judicious means of counteraction be adopted. The fatal effects of cold are favoured by repose; by the drowsiness, somnolency, or lethargy which it induces, and by a passive submission to this feeling; by previous excesses in spirituous liquors or intoxicating drinks, or even by the use of those at the time of exposure, if active exercise be not taken. But it is unnecessary to pursue the subject further at this place, than to associate its effects with other injurious agents, for the purposes of diagnosis, and of comparison with the action of other sedatives, or even with narcotic poisons, as this agent has been noticed above (§§ 28, 29.), and *specially* treated of with reference to its *effects* and *treatment*. (See art. COLD.)

266. *E.* DIGITALIS—*Digitalis purpurea* has been usually classed with narcotics, or acro-narcotics; but it is more properly a sedative than a stupefying agent, as this latter property is either not at all, or imperfectly evinced; and whatever narcotic effect may be considered as actually produced by it, in any instance, is to be imputed entirely to the depressed, paralysed, or departing manifestation of cerebral function. The irritation caused by digitalis in the digestive canal is not great, does not proceed to inflammation, and is attended by marked depression of vital power. The effects produced by it on the heart obviously depends upon the quantity taken, the rapidity of its absorption, or the accumulation of it in the system, and upon the other peculiarities of the case, and particularly upon those connected with the constitution of the patient. In many its ingestion, even in a very large and poisonous dose, produces acceleration of the pulse — sometimes remarkable acceleration; but the pulse is always then weak, compressible or small, the acceleration being manifestly, as in other cases, of great quickness of pulse, an evidence of extreme depression of organic nervous influence and vital power. But, as the irritability of the heart and other muscular parts become impaired with the depression of the organic nervous influence upon which it depends, the increased frequency of the heart's action, if it have occurred, subsides more or less rapidly into remarkable slowness and irregularity, with or without intermissions, until the action ceases altogether.

267. The noxious operation of digitalis is manifested in all animals. One drachm of the powder acts as a sedative in horses affected with inflammation. Two ounces destroyed this animal in twelve hours. The influence of this poison on the heart of the horse is various. At first, the action of this organ is sometimes accelerated; in other instances it is not affected, and in some it is retarded. It generally occasions diminished muscular power, convulsive movements, tremors, and loss of sensibility. Of the numerous writers who have discussed the operation of digitalis, there is none who has estimated it so accurately as Dr. PEREIRA, or at least so conformably with my own experiments, and with my observations of its effects during a period of thirty years. Many years ago, I tried the effects of it upon myself in large doses, in different forms of preparations; and in practice, I have pushed it in some instances, as far as appeared compatible with the safety of the patient.

268. *a. Symptoms.* — Dr. PEREIRA has distinguished *three grades* of operation of foxglove, or of poisoning by this plant; and I shall adopt the division. — (*a.*) *The first degree* is that usually produced by *small and repeated doses*, and consists chiefly of nausea or loss of appetite; of alteration of the heart's action, and of the pulse, which becomes irregular, or accelerated, or slower than natural, of depression of spirits, of impaired strength, and of increased secretion of urine. These symptoms observe no regular order, some-

times the diuresis, at others nausea, and occasionally the affection of the circulation being the first to appear. The influence of digitalis on the circulation is by no means uniform. In some cases, the pulse is accelerated or rendered full and soft; in others it is slower, or irregular; in many it is intermittent; and in others it is not materially affected. A small dose, in some instances, reduces the frequency of the pulse, and renders the pulsation irregular or intermittent, or both; whilst a very large dose may be taken without any material effect upon the action of the heart. In the summer of 1816 I took, whilst in good health, two drachms of the tincture at one dose; and finding no further effect from it than loss of appetite and slight depression, I took another drachm three hours afterwards. I find in my note-book that the pulse was not affected by it, during that and the subsequent day, further than it was readily accelerated by the least exertion, and that very slight nausea, but no drowsiness, was produced by it. Dr. WITHERING, in one case, found the pulse fall to 40 pulsations in a minute, and Dr. FOGO, in another, to 36. The lowest I have seen it from the use of foxglove was 44; but 50, or even lower, is not infrequent. The slowness is sometimes preceded not only by acceleration, but also by increased fulness, and softness. Even when the pulse is much slower than natural, in the recumbent posture, it generally rises very remarkably above the usual frequency in the sitting, and still more in the standing position. This is owing to the weakened state of the heart, caused by the digitalis, an increased frequency of contraction being required to compensate the loss of power, especially in positions unfavourable to an abundant supply of blood to the brain, by which the cerebral energy may be developed, and the nervous influence of the heart thereby reinforced and increased. This effect of position upon the action of the heart of a person under the influence of digitalis should be kept in recollection, and he should not be allowed suddenly to assume a sitting or standing posture; for the heart, already remarkably weakened, is unable to act sufficiently, or to overcome the increased obstacle which either of these postures furnish to it, especially when it loses the usual supply of cerebro-spinal nervous influence, or even when it experiences a diminution of that supply. Owing to these conditions, and to insufficient attention being paid to them, a patient may be seized with fatal syncope whilst he is under the operation of this substance; and there is every reason to believe that this occurrence has actually taken place oftener than once in these circumstances.

269. The influence of digitalis on the pulse is more remarkable in debilitated and anæmiated persons than in the plethoric or robust. Sometimes no effect is produced on the pulse in respect of number, force, or regularity, until nausea, vomiting, or headache is experienced; and occasionally a comparatively moderate dose may occasion these symptoms. SHROEK, as quoted by PEREIRA, experienced from two grains of foxglove nausea, headache; small, quick, and soft pulse; dryness of the throat; giddiness, weakness of the limbs; and, some hours afterwards, his vision became dim, with a sensation of pressure on the eyeballs.

270. The *cumulative effect* of digitalis is one of the most important facts to be kept in view in connexion with the use of small and repeated doses of this plant. After an indefinite time, during which the foxglove has been thus employed, without any very marked effect, or with a slight effect merely, dangerous symptoms, in some instances terminating in death, have suddenly appeared. These generally consist of remarkable irregularity, frequent intermissions, or extreme weakness and slowness of the heart's action; giddiness; pallor of the countenance; nausea; vomitings; watchfulness; impaired sensibility; and sometimes convulsions. Dr. PEREIRA and Dr. HOLLAND, however, consider this cumulative effect very rare. But this depends upon the time during which the digitalis has been exhibited, and the amount of the dose. Early in the present century, when this plant, especially the infusion of it, was given in large doses, and very indiscriminately, in dropsies, I met with several instances of the cumulative operation of it in most dangerous forms; and two of these occurred in patients for whom I had myself prescribed it, and in whom I had watched its effects. One of these perfectly recovered from both this operation of the remedy, and from the disease for which it was prescribed (dropsy); the other also recovered from this effect, and was partially benefited by the medicine; but the disease — tubercular consumption — ultimately terminated as usual. — *Salivation* is an occasional consequence of the use of digitalis in repeated doses; and it may occur even after a few moderate doses, as noticed by WITHERING, BARTON, PEREIRA, and myself.

271. (*b.*) *The second grade* of poisoning by digitalis is that which is most frequently produced by too large, or too long continued doses. The *symptoms* are described with great accuracy by Dr. PEREIRA. They are usually nausea or actual vomiting, slow and often irregular pulse, coldness of the extremities, syncope, or tendency to it, giddiness, confusion of vision, and loss of muscular power. The sickness is sometimes attended by purging, but oftener by diuresis, occasionally by neither. The patient complains of a sensation of weight, pain or throbbing of the head, especially the forehead; of giddiness, of weakness of the limbs, and watchfulness. He sees objects dimly, or of a green or yellow hue; or he sees motes, sparks or mists before his eyes. The pulse is feeble, sometimes accelerated, at other times slow, but is affected by the slightest exertion. There is remarkable tendency to syncope upon raising the head from the pillow, and to profuse cold sweats; sometimes delirium, stupor, salivation and loss of sensibility supervene. There is much difficulty in assigning the quantity of the drug capable of producing these effects, whether taken in a single dose or in divided quantities. Much will depend upon the state of the plant, the kind of preparation, and the constitution of the patient. I may, however, here state as the result of experiment and observation, that very large doses — three or four times the usual doses of either of the preparations, or even more — may be given without any effect during inflammatory action; that febrile excitement, physical exertion, and a high range of temperature seem to suspend the action of even very large quantities of the drug; whilst the depressing passions, cold, the contemporaneous use of antimonial preparations of colchicum, or of

refrigerants, manifestly accelerate and heighten their effects.

272. (*c.*) *The third, or fatal grade* of poisoning by digitalis is *characterised* by retchings, purging, griping pains in the bowels, remarkable faintness, cold sweats, anxiety and depression of spirits, collapsed features, vertigo, dilated pupil and disordered vision; a slow, feeble, irregular and small pulse, extreme physical depression and exhaustion, inability to sustain a sitting or upright posture, involuntary evacuations, low delirium, insensibility, convulsions, stupor and death.

273. *b. The appearances after death* by digitalis have not been accurately observed. There is, perhaps, no drug which has been employed, either medicinally or criminally, the operation of which has been more inaccurately described than this has been. Digitalis produces but slight irritation of the digestive mucous surface, the nausea, retchings, &c. sometimes observed, resulting more from the efforts of nature to throw off a depressing and poisonous agent than from any inflammatory action produced by it — these symptoms depending upon the reaction of vital organs upon an injurious influence affecting the ganglial or splanchnic nervous system rather than upon irritation. The symptoms which have been imputed to narcotism and to congestion of the brain arise from very different states; for the giddiness complained of, the convulsions even, and all the symptoms which may be referred to the brain, I am convinced, by careful observation, are results of impaired circulation in this organ, of weakened nervous energy, and of a deficiency of blood in the vessels within the head. I have always found the carotids pulsating weakly; the head cool, and the features sunk; and it is well known, that convulsions as often result from a diminution of blood within the cranium as from congestion or excess — perhaps oftener. Doubtless, when convulsions occur this state is altered, and congestion is the consequence; so that, when convulsions precede dissolution, a congested state of the vessels of the brain and of its membranes will be found. Digitalis acts as a poison — and even as a medicine — by depressing the organic or ganglial nervous energy, and consequently by lowering irritability and the tone of vascular action. The manifestations of life in the several organs are thereby similarly affected; the functions of absorption and of urinary secretion being the least disordered. The ultimate result is, that the depressed states of organic nervous power and of vascular action primarily caused by digitalis, impair the cerebro-spinal influence and the functions of sense and of muscular motion depending upon that influence; and that these states severally act and re-act on each other, when the poison is energetic, or its operation not counteracted, until the action of the heart ceases altogether.

274. *c. The treatment* of poisoning by digitalis must depend upon the circumstances of the case. If the symptoms are produced by a large quantity of the drug taken at once, and if there be reason to infer that it still remains even in part on the stomach, the removal of it either by the stomach-pump, or by vomiting should be procured. The sulphate of zinc is the most suitable emetic in this case, and it should be given in a full emetic dose with powdered capsicum, and vomiting should be encouraged by means of warm diluents containing stimulants, as ammonia, camphor, &c. When the poison is evacuated from the stomach, or when the symptoms are consequent upon repeated doses of it, or result from its cumulative influence, an immediate recourse to stimulants, as brandy, ammonia, camphor, opium, cardiac tinctures, capsicum, should be had; and mustard poultices, blisters, or other rubefacients ought to be placed over the epigastrium. Strong coffee or green tea may also be freely given. In the instances of cumulative poisoning by this plant which occurred in my practice (§§ 270.), camphor and ammonia with capsicum were chiefly employed, and green tea for drink. The noxious effects of digitalis, however produced, are not readily removed, but require the lapse of several days before they entirely disappear; the disorder of the pulse and the affection of the eyes being the last to depart. During the treatment of the effects of this poison, the patient should be kept in a recumbent position, a change to the sitting posture being allowed only with the utmost care.

275. *F.* Lead.—*The preparations of lead* are severally poisonous. The metal itself, is not injurious, if it remain unchanged. But when reduced to an oxide or a carbonate it becomes most injurious. Small shot has been swallowed in order to remove obstructions in the bowels, and evacuated without producing any inconvenience. Dr. Bryce (*Lancet*, Dec. 31. 1842) has recorded a case, however, of a man who took three ounces of small shot (No. 4.). On the third day he complained of great depression and anxiety, with sunken features, coldness of surface, dizziness, and numbness in the arms and legs. These symptoms continued to increase; purgations were administered to overcome the obstinate costiveness; and in a fortnight he recovered. In this case the metal was either oxidised or reduced to a salt in the stomach or intestines. The chief compounds of lead which have been found injurious are, the *carbonate*, the *acetate* and *sub-acetate*, the *chloride*, the *iodide*, and the *oxide*, combined either with vegetable acids or with fatty substances; and either of these may produce *acute* or *chronic poisoning*.

276. *a. Acetate of lead — Sugar of lead.* — This salt is productive of acute or chronic poisoning, according to the dose, the repetition of it, or the mode of its administration. Orfila found that, in large doses, it caused pain, vomiting, and death; and that when its action was slower, and absorption took place, paralytic and convulsive symptoms appeared. Owing to the disposition of the salts of lead, and especially the acetate, to combine chemically with the tissues, the villous surface of the digestive canal, in cases of acute poisoning with this salt, is whitened or otherwise discoloured by it. Injected into the veins, or applied to wounds, it affects the nervous system, causing vertigo, paralysis or coma, and convulsions, and congestion of the lungs.

277. *b.* The *symptoms* produced by the ingestion of this salt vary with the dose. Ten grains taken daily for seven days caused a sensation of tightness in the breast, a metallic taste of the mouth, constriction of the throat, debility, sallow countenance, slow respiration and circulation, turgid and tender gums, ptyalism, numbness of the fingers and toes, pains of the stomach and bowels, costiveness, but no nausea. These symptoms are

described by Dr. LAIDLAW, and agree with the symptoms I have myself observed in cases where large doses of this substance has been taken for several days. When much larger or poisonous doses, as three or four drachms or upwards, have been swallowed, a pricking, constrictive, and peculiar pain is felt in the throat and in the course of the œsophagus; pain, anxiety, and distressing aching are felt at the epigastrium, and diffusing themselves over the abdomen; vomiting takes place, and is attended by paroxysms of colicky pains, which are not increased by pressure, as in cases of inflammation, but, on the contrary, are relieved by it. Aching and anxiety, with a sensation of constriction of the abdominal contents towards the spine, are experienced in the intervals between the severe paroxysms of pain: the bowels are constipated; the skin is cold, and the strength prostrated. Giddiness, coma, convulsions, and death supervene, if suitable aid be not administered. This very *acute form* of lead poisoning is, however, comparatively rare. Much more frequently, after suffering for several days with the abdominal symptoms, the parietes of the abdomen being at first retracted, and subsequently tense and distended with air, owing to the paralysed state of the muscular coats of the intestines, the patient complains of cramps or loss of power of the muscles of the extremities, or of numbness or complete paralysis. The bowels continue constipated; vomiting occasionally takes place, preceded or attended by severe paroxysms of pain; torpor, coma, or convulsions supervene; or death takes place suddenly or unexpectedly.

278. *c.* The effects of this salt often pursue a more *chronic* course, and then are in all respects similar to those described when treating of *painters' colic.* (See art. COLIC, §25. *et seq.*) Dr. A. T. THOMSON (*Med. Gaz.* vol. x. p. 689.) has contended that the acetate of lead does not become poisonous until it is converted in the body into the state of a carbonate; but there is no proof of the carbonate having a more deleterious influence than the acetate. Dr. C. G. MITSCHERLICH has even shown that the acetate is not less injurious than the carbonate, especially when mixed with acetic acid, in which form it is more energetic than when given in the neutral state. (TAYLOR, op. cit. p. 169.)

279. *d. Sub-Acetate — Diacetate of lead — Goulard's extract of lead.* — This substance has caused death in a few instances, and is a more powerful poison than the neutral salt, probably owing to its containing a larger quantity of the oxide. Mr. TAYLOR states that two cases of poisoning by Goulard's extract occurred in 1840 in two children of four and of six years of age. The quantity taken was not great, but both died in thirty-six hours, with symptoms very closely resembling those of pestilential cholera. The bodies were inspected (§ 285.). Mr. MARSHALL, however, mentions a case of recovery from two fluid ounces of this extract.

280. *e. Carbonate of lead — white lead cerusse.* — It is insoluble in water, but still possesses poisonous properties, a decided proof, as Mr. TAYLOR remarks, among numerous others, that insolubility does not prevent a substance from exerting a poisonous action on the system. The gastric and biliary secretions, or the pressure of a free acid in the digestive canal, may dissolve a sufficient quantity to be deleterious. In a case reported by Dr. SNOW, a child, aged five years, ate a portion of the carbonate, ground up with oil, not larger than a marble. During three days, pain in the abdomen, and constipation alone were complained of. On the third day the symptoms were greatly aggravated, and vomiting occurred. The child died ninety hours after the injection of the poison; some very offensive stools, of a greenish black colour, having been passed just before death. A female, aged thirty-three, took, by mistake for magnesia, from six to eight drachms of the carbonate of lead. Five hours afterwards, Mr. CROSS found her in a cold perspiration, breathing heavily, with a frequent small constricted pulse. There were vomiting, dryness of the throat, anxious expression of countenance, and severe colicky pains. The extensor muscles became paralysed, and the flexors rigidly contracted. Sulphate of magnesia with dilute sulphuric acid and castor oil were given her, and very dark evacuations were procured. In four days she was convalescent.

281. These cases sufficiently illustrate the *symptoms* of the *acute form* of poisoning by carbonate of lead. The *chronic form* of poisoning by this substance, characterised by severe paroxysmal pains in the bowels, constipation, paralysis, &c., is identical with *painters' colic.* (See COLIC, § 25. *et seq.*) This form of poisoning is frequently caused by the absorption of the poison either by the lungs, or by the skin, or both. It has been found that, where the carbonate of lead was ground in a dry state, both the labourers and animals have died from its effects, owing to its diffusion in a state of impalpable powder in the air. Even the air of a newly painted room, especially when it is slept in, will, in some constitutions, produce acute or serious effects; but the chronic operation of this agent is most common. The diagnostic symptoms of this latter form of poisoning have been fully stated in the article referred to; but recently Dr. BURTON has shown, that blueness of the edges of the gums where they join the bodies of the teeth, generally attends, or even precedes, the usual symptoms of this form. Dr. CHOWNE, however, contends that the presence or absence of this lime is not connected with the effects of lead. Chronic poisoning by the carbonate of lead is not infrequently caused by *water* which has passed through lead pipes, or been kept in lead cisterns, especially if these have been new, and if the water contain carbonic acid. Hard water, or water containing the sulphate of lime, or any of the neutral salts, produce little or no action on metallic lead. (See *Guy's Hosp. Rep.*, vol. iii. p. 70.)

282. *f. Iodide of lead.* — *Plumbi iodidum.* — As this substance is employed in medicine, it is necessary that the injurious effects produced by it should receive attention. It is a fine yellow powder sparingly soluble in cold water, but readily soluble in boiling water. Twenty-four grains of the iodide were given to a cat, in two doses, with an interval of four hours between them. The animal suffered violent colic, and died in three days; but no signs of irritation were observed after death. Iodide of lead in doses of from five grains to thirty were given to a bull-dog. On the fifteenth day the animal refused food, and kept in the recumbent posture. He died on the eighteenth day, having swallowed altogether upwards of ten drachms of

the iodide. During the whole period he had only three or four intestinal evacuations. I have employed this substance both internally and externally; but it has not, in the form I have prescribed it, produced any marked signs of irritation.

283. *g.* The effects of the *chloride of lead* and of the *chromate of lead* I have not observed; but there is every reason to believe that they would be poisonous in large doses, the latter especially. The *sulphate of lead* has usually been considered as inert by ORFILA and others. The *nitrate of lead* acts in a similar manner to the acetate.

284. *h.* The *oxides of lead.*—The *yellow oxide*, and the *brown oxide*—*peroxide*—are but little known unless to chemists. *Litharge* and *minium* (*red lead*) are much used in the arts, and have caused poisoning accidentally. Liquids used for culinary or dietetic purposes, especially if they contain a free acid, may become impregnated with oxide of lead, derived from the glaze of the vessel in which they are kept, forming poisonous salts. Litharge glaze may also be dissolved by alkaline and fatty substances. All newly glazed vessels yield traces of lead on boiling in them acetic acid or caustic potash; the oxide of lead being dissolved by the acid or alkali. Litharge was formerly much employed to remove the acidity of sour wine, and convey a sweet taste; an acetate, or some other vegetable salt of lead being in these cases formed. Many years since, a fatal epidemic colic prevailed in Paris owing to this cause. The adulteration was discovered by FOURCROY. *Wine* thus adulterated is known by its being blackened by hydrosulphuret of ammonia. *Cyder*, *new rum*, and *sugar*, are sometimes the medium of conveying the salts of lead, owing to lead or its oxides being employed in certain parts of the apparatus or substances used in their manufacture. Dr. TRAIL found that, when new rum is kept in oaken casks, the tannin of the oak is slowly dissolved by the spirit, and the lead is precipitated in an insoluble form, the spirit thus becoming wholesome.

285. *i. The appearances observed after death* from lead poison have been very loosely described; and those which have merely been the results of congestion, of the coagulation of the blood in the veins and venous capillaries, with more or less discolouration from the chemical action of the poison, have been stated to have been inflammatory. Dr. MITSCHERLICH found that, when the dose of the acetate was large, the villous surface of the stomach was chemically changed by it—softened, corroded, and reduced to a whitish colour, owing to the combination of the salt with the tissue. When given in a small dose, the acetate was decomposed by the gastric secretions, and exerted no corrosive action on the villous surface. When this salt was reduced to a state of an albuminate and dissolved by acetic acid, death took place with great rapidity; but the stomach was not found corroded. This effect was produced by the neutral salt only, and not when the dose was small, or when the poison was combined with an acid. (TAYLOR.)—In the cases of poisoning with Goulard's extract mentioned above (§ 279.) the villous membrane of the stomach was found by Dr. BIRD of a grey colour, but otherwise perfectly healthy. The intestines were contracted, in one instance more so than in the other. In a case of acute poisoning by this extract that terminated fatally in forty-eight hours, the villous coat of the digestive canal, from the œsophagus downwards, was softened, and was said to present inflammatory appearances. The mucus on the internal surface of the canal contained much of the poison. The changes observed after death from the *chronic form* of poisoning by lead are described at another place. (See COLIC, § 25. *et seq.*)

286. *k.* The *modus operandi* of the preparations of lead deserves attention. These preparations, according to their physical conditions and modes of administration, may act locally or remotely, or in both ways. Certain of them, as the neutral acetate, by combining with the tissues, may act chiefly locally, and be only slowly absorbed. Their remote action may arise from their absorption from the digestive canal, from the skin, or from the lungs. When thus absorbed, to such an amount as to affect the organic nervous and vascular systems, the following effects appear: the temperature of the body sinks, the pulse becomes smaller and slower, the capillaries are somewhat constricted, the secretions from mucous surfaces diminished, and hæmorrhages, where they exist, are checked. This sedative and constringent operation is manifested chiefly in exhaling and secreting surfaces and organs. If the poison continue to be absorbed, the nervous and muscular systems are more or less affected, and the nervous and muscular systems of organic life are the first to betray disorder; as evinced by anxiety at the epigastrium, colicky pains through the abdomen, especially in the course of the colon, spasm of the muscular coats of the bowels, impaired secretion, and constipation. As the effects proceed, pain extends to the spine and to the limbs, spasms affect the muscles, especially of the extremities, or partial loss of sensibility or of the power of motion, or of both, appears. Ultimately the palsy becomes more or less complete, or giddiness, sopor, coma, or convulsions supervene, or even death takes place preceded by either of these.

287. Thus a *sedative* and an *astringent* action, and subsequently *morbid sensibility*, followed by *spasm*, and next by *palsy*, are produced by the absorption of these poisons. These effects generally appear to a greater or less extent, *first*, in the organic or involuntary, and extend to the animal or voluntary, nervous, and muscular systems. But occasionally they are only slight in the former, although severe or even fatal in the latter; or they are most severe in, or altogether limited, to the former. There can be no doubt of these effects being produced by the presence of the poison, in the state either of an oxide, or of a salt, or in some other form or compound, in the blood, and in the tissues. ORFILA detected lead in the urine of a female who swallowed an ounce of the acetate. TIEDEMANN and GMELIN in the blood of animals poisoned by it. Mr. TAYLOR in the milk of a cow poisoned by the carbonate; and Professor COZZI, WIBMER and others, in the blood, muscles, and viscera, after painters' colic.

288. *l. Treatment.*—The more *acute form* of poisoning by any of the preparations of lead, requires the exhibition of demulcents or diluents, holding in solution some sulphate—as of soda, magnesia, potash, or alumina. If vomiting does not follow the free exhibition of these, the sulphate of zinc may be given, or the stomach-pump be cautiously had recourse to, or the throat or fauces

may be tickled. If the patient has been poisoned by the *acetate*, the carbonates should be avoided, as they would increase the activity of the poison, whilst the sulphates would render it inert. Albumen, and casein, the albuminous principle of milk, precipitates the oxides of lead, and are, therefore, excellent antidotes when given in large quantities. The treatment should be somewhat different in cases of acute poisoning by the *carbonate of lead*. Mr. TAYLOR remarks, that the alkaline sulphates should not be employed as antidotes for these, since it requires long digestion at a high temperature for these salts to react on the carbonate of lead, and even then the decomposition is only partial. He suggests, therefore, the administration of an alkaline sulphate mixed with vinegar, or some weak vegetable acid, such as lemon juice. Emetics or the stomach-pump should also be employed. Afterwards the bowels ought to be duly evacuated, and oleaginous and demulcent enemata thrown up. If irritability of stomach continue opium should be given, and the colicky and paralytic symptoms ought to be treated as advised in the article COLIC (§§ 60—68.).

289. *G*, HYDROCYANIC ACID AND THE CYANIDES. — *Oil of bitter almonds, &c.— Prussic acid*, since its operation has been more generally known, especially as respects its rapid and unerring effects, has been frequently employed for self-destruction, and in some instances even for murder. Death has also occurred from it owing to accident. In 1837-8 there were twenty-seven cases of poisoning by it, nearly all of which were suicidal. This substance has been variously classed by writers on *Medical Jurisprudence*; some have viewed it as a *narcotic* because it produces insensibility in fatal cases. Others have considered it as an *irritant* poison, because it often produces spasms or convulsions, although no evidence of irritation is furnished by it on the tissues. But spasms or convulsions attend all intense impressions on the nervous system, especially when these impressions destroy life. Others again believe it to be both narcotic and irritant, or *narcotico-irritant*; and, not being content with imputing to it a single property which it does not possess, assign to it two properties of which it is equally devoid; for no one becomes unconscious from it, or is spasmodically or convulsively affected by it, if, indeed, they be so affected at all, until life is departing or about to depart. As it therefore *annihilates* the manifestations of life in a few seconds, and in a way in which no irritant or narcotic ever acts, however energetic, comparing its action with theirs; and as there is no other terms which convey the idea of its mode of action better than *sedative* or *paralysing*, I am obliged to adopt them, as indicating the *privation of sensibility and all vital action*, the chief properties evinced by it, when applied in a poisonous dose to a living body,—as indicating the *annihilation of life*.

290. Common hydrocyanic acid is a mixture of the pure or *anhydrous acid* with water, and sometimes with alcohol. As it is kept in shops, it varies from 1·3 to 6·5 *per cent.* of the anhydrous acid. The *two* chief forms in which it is kept are, that of the London Pharmacopœia, which contains two *per cent.*, and that of SCHEELE, which contains from four to five *per cent.* of anhydrous acid.

291. *a*. The *symptoms* caused by poisonous doses of this acid vary with the mode of exhibiting it, and with the quantity up to a certain amount; but, beyond that, the effects are tolerably uniform. — *Inhaling the vapour* of hydrocyanic acid produces death more rapidly than any other mode of employing this poison. Dr. PEREIRA caused the almost instantaneous death of a rabbit by applying its nose to a receiver filled with the vapour. This acid also acts rapidly when applied to an *abraded surface* or to a *wound*. SOBERNHEIM states, that an apothecary at Vienna died within an hour after the entrance of the acid into a wound in the hand produced by the glass vessel in which it was contained. Even when applied to the sound skin it produces some degree of action. After applying SCHEELE's acid to the fingers for a short time I experienced numbness, extending considerably above the place of application, that continued for several hours, and in one occasion the whole day. Dr. CHRISTISON says that M. ROBIQUET's fingers were numb for several days after their exposure for some time to the vapour of the acid. Judging from these facts, this acid cannot be viewed as devoid of influence upon the *unabraded* or *whole skin*.

292. *b*. On *mucous membranes*, this poison acts with rapidity and certainty. Mr. NUNNELEY, whose researches into the operation of this substance have been most extensive, states, that when applied upon a mucous membrane, as the conjunctiva, the rectum, or the vagina, prussic acid acts with as great rapidity as when swallowed. A knowledge of this is of importance, as poisoning may be effected in this way, and detection of the crime would be very difficult. The action of the acid on the lungs, when air impregnated with it is breathed, is not only rapid but certain in its effects, and is one of the easiest modes of exhibiting it, but the most difficult after a few hours to detect, as the odour being so diffusible is very soon dissipated.

293. *c*. When *swallowed*, prussic acid produces almost instantaneous effects if the quantity be sufficient to destroy life, or if the stomach be not loaded with food, which may intercept a large portion of it, and delay its operation. But the *symptoms* produced by a dose hardly, or barely sufficient to cause death, are different from those observed when the quantity is large, and death very rapid. The effects are more rapid and certain in young and delicate persons,—in weak constitutions, and when the stomach is empty than in the middle-aged and the robust, and when the stomach contains more or less food. (*a*.) A *small poisonous dose* occasions a bitter warm taste, which is soon followed by sensations of faintness and giddiness. The respiration becomes slow, difficult, and spasmodic, the pulse small or imperceptible; and insensibility supervenes, often with convulsions; a state resembling an epileptic paroxysm being sometimes produced. The pupils are either contracted or dilated, and the eyes staring. If the treatment about to be recommended be resorted to in this state, recovery usually takes place rapidly, vomiting often occurring.

294. (*b*.) In *a large or rapidly fatal dose*, the phenomena are such as hardly admit of observation; death follows so quickly, and is attended by so few symptoms, excepting the cessation of sensibility, of breathing and of the heart's action. In the

case of a chemist in my vicinity who took more than an ounce of SCHEELE's preparation, death must have occurred in a few seconds, neither spasms nor convulsions having been observed. In a case communicated by Mr. FRENCH to Mr. TAYLOR, seven drachms of the common prussic acid was taken, and about two minutes afterwards he was found lying on the floor insensible. There were no convulsions of the limbs or trunk; but a slight flickering motion was observed about the muscles of the lips. Respiration seemed to cease for some seconds; it was then renewed in fits, expiration being deep and slow. The deceased took the poison while ascending the stairs; his body was found on the landing; the bottle had rolled some distance from him, the stopper was lying in another direction. SIMON relates a case in which an ounce was taken; the symptoms were the same. The hands and feet were cold, and no pulse could be felt. The finger-nails are often of a livid colour, and the hands clenched. When the dose is large, the odour of the acid is generally exhaled from the mouth.

295. *d*. The utterance of a *scream* or *shriek* has been said to be indicative of poisoning by this acid; but Mr. TAYLOR states that this symptom does not occur in the human subject; and Mr. MILLS, the deputy coroner, says that his inquiries show that it does not occur. There is merely a gasping for breath, or a low moaning or sobbing noise. Mr. NUNNELEY found that the shriek or cry did not occur in more than about one half the number of cases of animals, and only in about one-third very loudly. When it was uttered in animals, it was of a peculiar kind, and so indicative of distress as to give an idea of consciousness on the part of the animal of impending death — it was characteristic of the poison. When the dose of prussic acid is small but still fatal in the human subject, *convulsions* have sometimes been observed; but they have not been met with when the dose has been large and death rapid. In these latter cases the symptoms have been scarcely noticed; but are probably the same as seen in the lower animals, namely, imperceptible pulse, insensibility, a few deep and slow respirations, and death. Mr. NUNNELEY's experiments, as well as the history of several cases in which large quantities of this poison have been swallowed show that death is seldom so rapid as to prevent volition and voluntary motion being exercised for a few seconds afterwards,—but in a few seconds death often takes place without a struggle. The most rapidly fatal case with the particulars of which I am acquainted, was that of a gentleman whom I knew, and which occurred in 1828. Above an ounce of SCHEELE's acid was taken. Instantly upon swallowing it, he must have repented of his act, for he hastily called out, brandy, ammonia, repeating the words, fell down and never moved afterwards. In some few instances, Mr. NUNNELEY found the action of the poison so expeditious as to prevent the slightest exhibition of voluntary motion; but in the majority of warm blooded animals and dogs, about twenty seconds elapsed before the symptoms were manifested — thus allowing, presuming that a similar interval would occur in man, sufficient time for several acts being performed, which were supposed by many to have been doubtful, if not impossible, after the ingestion of the poison.

296. *e*. It has been supposed, that this acid possesses an *accumulative property*—that after having been taken for some time, in moderate doses, without any apparent mischief, it may, without any remarkable increase of quantity, suddenly give rise to all the effects of poisoning. Mr. TAYLOR states that one case is reported which renders this opinion probable, and another has been communicated to him which tends to confirm it. Dr. LONSDALE, who has paid some attention to this matter, does not admit that prussic acid possesses this property, on account of its volatility and diffusive influence; and although I have very frequently prescribed this substance I have not seen any proof of an accumulative influence. Mr. TAYLOR states, that serious effects have followed slight alterations made in the dose; but I have never met with such. The proper test is to observe whether or no such effects follow the persistence in the use of the same dose. It is very important, practically, to determine the question.

297. *f*. *Post mortem appearances*.—In cases of suicide or accident, the vessel which contained this poison will generally be found near the body. But the person poisoned may have thrown it from him upon swallowing its contents. The body commonly exhales an odour of prussic acid for some time after death; but if it has remained exposed for some time before it is seen, and especially if it be exposed to the open air, or in a shower of rain, the odour may not be perceptible. Putrefaction is said to be accelerated after death by this poison. This appeared to have been the case in two instances which I had occasion to observe. Mr. TAYLOR doubts this effect. ORFILA states that in most sudden deaths, from whatever cause, putrefaction is, *cæteris paribus*, accelerated. Externally the body is commonly livid; the nails are blue, the hands clenched. The jaws are closed; and there is some foam about the mouth, especially when death has been preceded by convulsions. The face is bloated and tumid; the eyes prominent, shining, and glassy; and the veins are congested with dark blood. The stomach and alimentary canal are generally in a natural state; the internal surface being sometimes red or congested, as often seen after sudden death. The lungs are generally more or less congested. The brain is usually congested, especially in the less rapidly fatal cases, and when convulsions have preceded death. The blood is sometimes found quite fluid, in others thicker or semi-coagulated. It is generally of a dark colour; but Mr. TAYLOR, quoting HELLER and METZDORFF, says that it is occasionally red, or even of a pinkish hue. Other changes noticed by writers may be viewed as accidental. Indeed there is no organic alteration observed that can account for death from this poison. Those now stated, — and they are the chief met with, — are slight; and are seen in other cases of sudden death. Life is so soon destroyed by this agent as not to allow of any change beyond simple congestion taking place. In a case reported by Dr. GEOGHEGAN, where an ounce of the acid was swallowed, a patch of dark-red extravasation was found under the villous coat near the pylorus. In a case recorded by Mr. POOLEY, the blood was of a very dark colour; but the lungs were not congested; in one by Mr. HICKS they were much congested; whilst in another by Mr. NUNNELEY they were only partially congested. In an instance reported by Mr. CRISP,

the abdominal and thoracic viscera were all healthy, the blood imparting to them a purple hue. (TAYLOR.)

298. On opening the stomach the *odour* of prussic acid is frequently perceptible, and if the quantity taken has been large, the odour may continue for several days after death. If the inspection has been recent after a large dose, the odour is often perceived in all the cavities and even in the blood. This odour has a distant resemblance to that of bitter almonds; but it is accompanied with a peculiar impression of acridity on the nostrils and back of the throat. But this odour — the diluted odour of bitter almonds, — may be perceived by some persons and not by others; or it may be entirely absent. It may not be present, or not perceived in a very sensible manner in the dead body, if the dose of the poison has been small; if the patient has survived a short time after it has been taken, if it be masked by other odours, and if the body has been dead some time, or has been exposed to the air, &c. (§ 297.)

299. *g. Relation between the rapidity of the effects and the quantity and concentration of the poison.* — Dr. CHRISTISON has shown, that beyond a certain dose, the weak and the strong acids appear to act with equal rapidity. Experiments on animals and facts observed in the human subject show, that a dose of the poison sufficient to cause death may have this effect in as short a time as a very much larger one, — that a drachm of SCHEELE's acid may cause death as rapidly as three or four times the quantity, especially if the poison be taken on an empty stomach, and if the person be weak, or debilitated by disease. It hence follows, that if two drachms of this acid be fatal in a given time, it cannot be inferred that twice or four times the quantity will be fatal in one half or one fourth of that time. Mr. NUNNELEY states, "that, when called to a person poisened by this acid, we cannot merely, from the length of time he has survived, or the evidence of the symptoms, determine any thing with certainty as to the degree of concentration or dilution of the acid, nor, except within wide limits, much as to the absolute quantity taken." (p. 83.) He moreover found that concentration does not heighten the effects of this poison, but that dilution to a moderate extent even renders them more speedy, probably from bringing the poison in contact with a larger extent of surface at the same instant. It may happen that a dose just sufficient to destroy life may fail, or be longer in producing its effects, owing to its interception by the food on a full stomach, or by other circumstances pointed out above; but a quantity sufficient to destroy life under any circumstances may have this effect with as great rapidity as three or four times that quantity. — Hence there is no relation, beyond a certain amount, between the rapidity of the effects, and the quantity or concentration, of this poison.

300. *h. Quantity required to destroy life.* — Dr. GEOGHEGAN relates an instance of a quantity of the acid having been taken equal to twenty-seven drops of the dilute acid of the London Pharmacopœia (at two per cent.) without any effect, the dose having been gradually raised to this amount; but when the dose was raised to thirty-six drops, the patient in two minutes was seized with the usual symptoms, and nearly lost his life. The quantity of anhydrous acid swallowed in this dose was only about two-thirds of a grain; but, as this substance had been taken in gradually increased doses, the probability of an accumulative effect having here resulted should be taken into consideration — a question of great practical importance, but one which is solved with difficulty. Mr. HICKS furnishes, in the case which he has reported, the *smallest dose* which has been determined with accuracy, as productive of death. A healthy adult female took a dose, equivalent to *nine-tenths* of a grain of anhydrous prussic acid — to forty-nine drops of the dilute acid of the pharmacopœia — and to twenty-five of SCHEELE's acid. She died in twenty minutes. In a case observed by Mr. T. TAYLOR, a stout healthy man swallowed exactly the same quantity by mistake, remained insensible for four hours, when he vomited, and began to recover. The vomited matters had no odour of the poison, and hence absorption of it had probably taken place. This quantity, nine-tenths of a grain of anhydrous acid, or *one grain*, may therefore be viewed as sufficient to destroy human life, although a somewhat smaller dose may have this effect, in certain circumstances, or a somewhat larger dose may fail of producing it, in others. Mr. TAYLOR thinks that the *largest dose* from which an adult has recovered was in a case reported by Mr. NUNNELEY. The person swallowed forty minims of an acid, at 3¼ per cent. The man was for a short time conscious, got into bed after taking it, and spoke. He felt his jaw become stiff, and then remained insensible until roused by the cold affusion. Although recovery took place in this case, still the inference just stated, as to the quantity which may destroy life, remains unaffected by it.

301. *i.* The *period at which death takes place* differs in different cases, although the dose taken may have been the same. This may be expected from the different circumstances above shown to influence the operation of poisons. In the seven cases which occurred in Paris, from the same dose of the poison given to each at the same time, death took place after periods varying from fifteen minutes to three quarters of an hour. It is only when the dose is just sufficient to cause death, that an individual survives from half an hour to one hour; but I know of no case in which the period was longer than an hour. In one instance, in which seven drachms were taken, death took place within five minutes; and in another, where an ounce was swallowed, within ten minutes. In the case referred to, as that in which the smallest fatal dose was observed, death occurred in twenty minutes. When the quantity is two drachms or upwards, the period of death varies from two to ten minutes.

302. But it is necessary to distinguish between the periods at which insensibility and absolute death take place. For, although death does not commonly ensue until after a few minutes, insensibility — the loss of volition and consciousness — may occur in a few seconds. Dr. LONSDALE states, that a drachm of SCHEELE's acid would affect an ordinary adult within the minute, and three or four drachms within ten or fifteen seconds. When the acid is stronger, and the quantity larger, he believes the annihilation of the sensorial functions to be immediate. Mr. TAYLOR remarks, with reference to this topic, that while, as a general rule, insensibility may supervene

from a large dose in a few seconds, the individual occasionally retains a power of performing certain acts indicative of consciousness, volition, and locomotion, for a few seconds.

303. *k. Diagnosis of poisoning by prussic acid.*—But little is required to be said as to this topic, after what has been already advanced. The effects of this poison will be readily distinguished from those of *opium* or of other *narcotics* or *acro-narcotics*, as the coma caused by these poisons is seldom seen until after the lapse of a quarter of an hour, or twenty minutes; whilst insensibility, from this acid, even in small doses insufficient to cause death, is very rarely delayed beyond two minutes. Besides, the patient may be roused from the narcotic influence of opium or other narcotics; but he cannot be roused from that produced by prussic acid, until he entirely recovers from it. Convulsions furnish no diagnostic evidence. In poisoning by this acid, a fatal issue always occurs within an hour, more frequently within a quarter of an hour; whilst poisoning by the substances referred to seldom terminates fatally before a period varying from six to twelve hours. The odour of the acid, when perceived, is also an important diagnostic proof (§§ 297, 298.).

304. It is of the greatest importance that the effects of this poison should not be confounded with death from *epilepsy*, *apoplexy*, or *disease of the heart*, in either of which death may take place within the period in which prussic acid proves fatal. A *post mortem* examination will generally furnish the diagnosis, when no other evidence can be obtained, or can be depended on, especially as regards apoplexy and cardiac disease: but as respects epilepsy the proofs may be incomplete, unless the odour of prussic acid be present. It may likewise be important to determine whether the poisoning by this acid has been *suicidal* or *accidental*, especially if the life of the individual be insured. In general, the several circumstances observed in connection with the case are such as at once explain the nature of it; but there are no means by which suicide may be more secretly perpetrated than by that now discussed. As to this topic, I must refer the reader to what has been stated by Mr. TAYLOR and Dr. CHRISTISON.

305. *l. Modus operandi.*—The local and primary operation of this poison is certainly upon the nerves of the part. This is shown by the numbness produced by it when applied to even the unabraded skin. In some experiments I made with it, many years ago, it was found to impair the irritability of muscular parts, and in some instances to destroy this property altogether in those parts to which it had been applied. It also, in these experiments, caused dilatation of the capillaries, with congestion and stagnation of the blood in them. That the local impression made upon the nerves, more especially upon those of the cerebro-spinal system, is rapidly transmitted to the brain, medulla oblongata, and spinal chord, cannot be doubted; for the abolition of the functions of those parts of the nervous system is generally so instantaneous, especially when the stomach is empty, that it cannot be imputed altogether to the absorption of the poison, although absorption undoubtedly takes place very rapidly, and destroys life: the insensibility resulting more immediately from the impression of the poison, the arrest of the heart's action, and death proceeding consecutively from the absorption of it. That this poison is absorbed is fully proved by the detection of it, by chemical agents, in the blood, and by the odour of this fluid in the cavities when they are opened, and in several viscera; thus showing that its operation on organs remote from the part to which it is applied, and the death of the individual take place mainly through this channel—that the heart is paralysed, and its action altogether arrested by the presence of the poison in the blood. There is, however, sufficient reason to believe, that the very decided and immediate impression produced by it upon the nerves of the part to which it is applied is rapidly propagated to the *medulla oblongata* and brain, through the medium of the nerves, before the poison reaches the nervous centres, or heart, by the medium of absorption, or through the channel of the blood; for Mr. NUNNELEY found that, "when the acid was administered by the rectum or the vagina, both hind legs of the animal were sooner affected than the anterior part of the body." (p. 76.)

306. The *cause of death*, in cases of poisoning by prussic acid, appears, after the best attention I can give the subject, and after much experience of its medicinal effects, to result as follows:—1st. The deleterious impression made by the poison upon a sufficiently large surface, or to a certain amount, being transmitted by the nerves to the *medulla oblongata or its vicinity*, causes insensibility, and, if that impression is not of overpowering or annihilating intensity, convulsions also:—2d. That the deleterious impression is less violently, or more slowly, developed or extended through the ganglial nervous system; and that, before life is destroyed by the impression made on the nervous system, absorption of it, to a greater or less amount, into the circulation takes place; and, 3d. That the presence of the poison in the blood entirely abolishes the already impaired respiratory and circulating functions by its action upon the nervous centres, and on the heart itself. The poison may thus be viewed as acting primarily upon, and through the medium of, the nervous system, and consecutively, by absorption and through the channel of the circulation; the latter completing, what the former mode may have failed of accomplishing.

307. *m. The chemical combinations of hydrocyanic acid* are more or less poisonous. (*a.*) COULON, ROBIQUET, SCHUBARTH, and MAGENDIE have demonstrated the poisonous action of the *hydrocyanate of ammonia*, and of the *hydrocyanate of potass*. A dog was killed in twenty minutes with twenty drops of the diluted acid neutralised by ammonia; and another in three hours by twenty-five drops neutralised by potash. Nevertheless, ammonia is one of the best antidotes to the action of this acid, when administered after the poison. ORFILA relates a case in which six grains of the hydrocyanate of potassa proved fatal within an hour, in the human subject, when administered in an injection.

308. (*b.*) The deleterious properties of the *ferrocyanates or triple prussiates* are much more doubtful than those of the former. Some experimenters with it have found that the *ferrocyanate of potass* is poisonous in large quantities; whilst others state that it possesses little or no deleterious property. WOLLASTON, MARCET, EMMERT, MAC-

NEVEN, and SCHUBARTH say, that a drachm, or even two drachms, of this substance may be given with impunity to man or the lower animals.

309. (*c.*) *The sulpho-cyanic acid*, a substance analogous in its nature to the ferrocyanic acid, was once supposed like it to be a poison of great activity; but this, Dr. CHRISTISON adds, admits of some doubt. Dr. WESTRUMB considers it more poisonous in the form of *sulpho-cyanate of potassa*. WIBMER reports that SOEMMERING found both this acid and the salt to be poisons of great energy; for half a drachm of concentrated sulphocyanic acid given to a dog occasioned immediate death, — and the same quantity of the salt killed another in one minute. These substances require further investigation. They are certainly more energetic than they have been viewed by Dr. CHRISTISON. Dr. WESTRUMB detected this salt in the blood and in the viscera.

310. (*d.*) *Cyanide of potassium* is a poisonous salt much used in electro-gilding and plating. It is a solid, sometimes a chalky-looking, at others a crystallised substance; and without odour, until put into water, when it is freely dissolved, forming an alkaline solution, from which prussic acid is abundantly evolved. It is used medicinally on the Continent. Mr. MALAGUTI states that a dog was killed in a few minutes after taking less than three grains of the cyanide in solution, and that the largest dose that should be given to the human subject is five sixths of a grain. A person was killed at St. Malo by too large a quantity of it having been prescribed. Another person died at Breslau after fifteen minutes from taking a dose of a mixture containing fifteen grains of this substance. The symptoms were the same as those produced by the pure acid.

311. *n. Various vegetable substances contain hydrocyanic acid*, and are poisonous in consequence. The plants which have been found to yield hydrocyanic acid belong to the division *Drupaceæ*, of DECANDOLLE'S natural order *Rosaceæ*. They are the *bitter almond*, *cherry-laurel*, *bird-cherry*, *peach*, and the *mountain ash*. The poison is procured from these, according to Dr. CHRISTISON, in two forms, — as an essential oil, and as a distilled water. The *distilled waters* yield hydrocyanic acid, and an essential volatile oil, which also retains much of this acid, which is peculiar, and which requires further investigations into its constitution and effects; but I must refer the reader to Dr. PEREIRA'S *Materia Medica*, where the subject is fully discussed. (See vol. ii. p. 1536.)

312. (*a.*) *The volatile oil of bitter almonds*, and even the bitter almonds themselves, are poisonous and owe this property to prussic acid, none of which, however, exists already formed in the kernel of the fruit, nor is it produced unless by the agency of water on the kernel. Even the mastication of the kernel produces the poison which destroys life. Mr. TAYLOR found that mere trituration of the almond kernel with water produced hydrocyanic acid. There are instances on record, wherein these almonds, when eaten in large quantity, have produced dangerous symptoms and even death. The *volatile essential oil* is a most active poison; its deleterious action depending entirely upon the hydrocyanic acid which is intimately combined with it. Five pounds of the almond are said to yield about half an ounce of the oil, and the quantity of anhydrous acid contained in it varies, according to Dr. CHRISTISON, from eight to fourteen *per cent*. It is thus at least four times as strong as the dilute prussic acid of the pharmacopœia. Sir B. BRODIE happening to touch his tongue with a rod which had been dipped in this oil, suffered almost instantaneously an indescribable sensation at the pit of the stomach, feebleness of the limbs, and loss of power over the muscles; these effects being, however, quite transient, but sufficiently evincing the rapid propagation of the deleterious impression through the medium of the nervous system.

313. Several instances of poisoning by this oil are recorded; and some have been noticed by CHRISTISON, PEREIRA, and TAYLOR. The last of these writers adduces the following: — A druggist swallowed by mistake half an ounce of "almond flavour." In half a minute he fell down in a state of syncope; his face being deadly pale, and his pulse imperceptible. After some time he rallied and vomited some undigested food and bile, strongly impregnated with the odour of bitter almonds. Delirium with slight convulsions came on. He then became sensible, and conversed upon his condition; but he again gradually relapsed into delirium, his eyes being prominent and brilliant. In a few minutes he again became sensible and slowly recovered. The quantity of "almond flavour" which he had taken contained about half a drachm of essential oil. In a case which occurred to Dr. BULL of Hereford, seventeen drops of the oil destroyed the life of a woman aged forty-nine in half an hour. Mr. TAYLOR here justly remarks upon the disgraceful state of medical police and legislation in this country, in the fact of a most virulent poison being sold for the purpose of flavouring pastry and liqueurs; but Mr. TAYLOR cannot surely be ignorant that British legislation does not concern itself with means which either destroy or preserve human life, until public opinion or an overwhelming necessity compels attention to such matters, and then they become objects of disgusting jobbing and disgraceful traffic, the measures which they produce benefiting chiefly the subservient supporters of a political party, the members of a clique, the satellites of power, and the worshippers of mammon.

314. Even a very small dose of this oil may cause fatal effects. Mr. TAYLOR, amongst other interesting cases, gives the following: — A girl about eight or nine years of age swallowed about a tea-spoonful of "ratafia," composed of one part of the essential oil of bitter almonds and seven parts of spirit. About seven drops of the oil were taken. When seen immediately after the accident there were complete insensibility, closed eyelids, brilliant and glassy eyes, dilated pupils, quick pulsation of the carotids, no pulse at the wrist, relaxation of the muscles of the extremities, and rigid contraction of the muscles of the lower jaw. Cold affusion with stimulants, stimulating frictions, and emetics were employed. Vomiting was induced; the ejecta had a strong smell of prussic acid; and the child recovered. — (SMITH, in *Lancet*, June 1844.) In a fatal case of poisoning by this oil, no odour was perceptible about the mouth when the body was found; but upon *inspection*, a powerful odour of prussic acid es-

caped from the cavities. All the viscera were in a healthy state. (*Med. Gaz.*, April 7. 1843.) The *vapour of this oil*, although it may cause vertigo, or stupor, is not likely to produce death unless it be inhaled for a considerable time.

315. (*b.*) *Laurel water—Cherry laurel water*—is a very weak solution of prussic acid, containing about a quarter of a grain per cent. of the strong acid. In large doses it produces the usual effects of prussic acid. — *Cherry laurel* was formerly much used for flavouring liqueurs and sweet-meats. Almost every part of the plant is poisonous, especially the leaves and kernels, but the pulp of the cherry is not. *Cherry laurel oil* is a weaker poison than the oil of bitter almonds, and contains about three per cent. of the anhydrous acid. Coullon relates an instance of the death of a child from the application of the leaves to a large sore on the neck. The distilled water and the oil of this plant are poisonous when introduced into the rectum, or into the cellular tissue, or injected into a vein, and when thus employed, or when swallowed, they occasion giddiness, palsy, insensibility, convulsions and death; thus acting in a similar manner to the pure acid.

316. (*c.*) *Peach flowers and kernels, and the fresh young shoots of the plant*, are poisonous. Coullon adduces two fatal cases of poisoning with *peach-blossom*. But the effects are different from those produced by pure hydrocyanic acid, as the peach-blossom acts more as an irritant of the digestive canal, and causes, in addition to insensibility and convulsions, efforts to vomit, and violent purging. A medical man swallowed half an ounce of a liquid prepared by digesting gin on a large quantity of *peach kernels*. He became giddy, and had violent constriction of the fauces, and dimness of sight. He vomited and recovered. (Taylor.) There are other plants which yield a distilled water and an essential oil containing more or less prussic acid; but as these are not used, at least in this country, I shall only refer to Dr. Christison's excellent work respecting them.

317. *o. Treatment of poisoning by prussic acid and its compounds.*—(*a.*) The remedy which is most efficacious in the treatment of the effects of these poisons is fortunately one which may generally be obtained without delay, namely, *cold water*, the *affusion of which upon the head, occiput*, and *nape of the neck*, rouses the patient from his insensibility more rapidly than any other means. This treatment was first recommended by the author of this work in the *London Medical Repository*, for July, 1825. It then attracted no attention, and was not even noticed by any of his contemporary editors. Dr. Herbst of Göttingen, however, in 1828, three years afterwards, recommended the same remedy, and the recommendation was then noticed in the British Medical Journals. The author, however, asserted his prior claims in the ninth and tenth volumes of the Medical Gazette. Dr. Herbst made several experiments on animals to show the efficacy of this treatment; which has now been tested in many cases in the human subject. It is of course the more successful the earlier it is employed; but as long as respiration and the heart's action continue, it should be resorted to and repeated according to its effects. The presence of convulsions, or of general palsy in addition to insensibility, should not prevent the administration of it. Indeed, convulsions and spasms may furnish grounds for hopes of success from it; and in cases where the insensibility and general palsy have been extreme, the occurrence of convulsions or spasms has been indications of commencing benefit. The water should be about the temperature of spring water; should be made to fall in a full and large stream upon the head — the vertex, occiput and neck; and be repeated at short intervals according to its effects; and in a similar way to that advised by the author for poisoning by opium. (See *Lond. Med. Repos.*, vol. xviii. and hereafter.)

318. (*b.*) *Ammonia* has been considered by many as the most energetic antidote. It was advised by *Mr. John Murray*, and may be employed by inhalation, or in any other manner according to the state of the case. When given internally, the strong *aqua ammoniæ* should be diluted with twelve parts of water. It is most advantageously employed when the patient is roused, or even partially roused by the cold affusion; and then the *inhalation* of the vapour of ammonia, if properly managed, is more efficacious than the ingestion of the remedy, which may not be accomplished, or even attempted when insensibility, convulsions, and spasms of the muscles of the jaws are urgent.

319. (*c.*) *Chlorine* has also been advised as an antidote for this poison by Riaux, Buchner, Simeon, Cottereau and Valette. Orfila considers it the most efficacious antidote of any hitherto advised. Unfortunately the patient may be dead before the antidote can be procured in almost every instance in which it will be required. The excellency of a remedy will avail but little the patient when it cannot be procured, or when he is no longer capable of breathing or swallowing it when it reaches him, even when it has been procured with the utmost rapidity.

320. The means, therefore, upon which confidence may be placed are the cold affusion, the inhalation of the vapour of diluted ammonia, or of chlorine, when it can be obtained in time, and the ingestion of stimulants. As this poison is usually taken with a suicidal intention, an excessively large dose is generally swallowed: and this excessive quantity often precludes success from any of the means already mentioned, or from any other. The immediate evacuation of the stomach by the stomach-pump, or the administration of a zinc emetic, conjoined with cordials and stimulants, as capsicum, &c., ought not to be overlooked. As this poison and its compounds cause congestion of blood within the cranium, blood-letting, or cupping on the nape of the neck may prove most beneficial in some cases, where this effect appears most urgent, and the habit of body admits of this practice. But it should not be overlooked that blood-letting may accelerate the absorption of the poison; and therefore the stomach should be emptied in the first place, if it be considered that much of the poison still remains in it.

321. *H.* Zinc — Oxide of. — This substance is not productive of serious effects even when taken in large quantity. Owing to its insolubility its absorption must be slow. When taken internally for a long time it acts as a slow poison, and produces a *tabes sicca*. A gentleman, for the cure of epilepsy, took daily twenty grains of the oxide, until he had consumed 3246 grains, which must have been

a course of five months' duration. At the end of this time he was pale, wasted away, almost idiotic, and the surface of an earthy hue. His tongue was thickly coated, the bowels constipated, the inferior extremities cold and œdematous, the abdomen tumid, the superior extremities cold and shrivelled, and the skin dry like parchment; and the pulse about sixty, thready, and almost imperceptible. Under the use of purgatives, a light nutritious diet, and tonic and diuretic medicines, he rapidly recovered; but still remained subject to epileptic attacks.—(*Brit. and For. Med. Review*, July, 1838.)

322. *I.* THE VAPOURS OF ETHER, AND OF ALCOHOL, when inhaled into the lungs, until they are imbibed by the blood circulating in the bronchial surface and lungs, produce a paralysing influence upon the cerebro-spinal nervous influence; the vapours of the ethers paralysing or altogether suppressing sensibility; and the vapour of alcohol affecting more especially voluntary motion, or both voluntary motion and sensibility. Owing to these effects, the consideration of these agents might have fallen under the present class; but I shall notice them more particularly under the *class of stupefying or narcotic poisons.*

323. CLASS III. EXCITANTS.—STIMULANTS. — EXCITING AND EXHAUSTING POISONS.—There are various substances, which are simple excitants or stimulants, as respects either the nervous influence or vascular action, and which, when taken in moderation, are in no way injurious, unless a too frequent recourse be had to them. If, however, those be administered in excessive doses they may produce injurious or even fatal results, owing either to excessive stimulation or to its consequences, especially exhaustion, congestion, effusion, and other changes in vital organs. Fatal effects, however, from most of the substances comprised in this class, are comparatively rare; and when they produce these effects, they operate more or less upon, or through the medium of the blood, and thereby seriously affect the functions of the brain, heart, and lungs. It is not improbable that certain excitants may act so energetically upon the nervous system, and, through them, upon the vitality of the frame, as rapidly to exhaust or destroy the influence of these systems, and vitality in all its manifestations. An intense electric shock, or lightning, may produce this effect; and we may conceive a shock from a galvanic battery of such violence as immediately to occasion the same result. In these cases the agent acts upon and through the medium of the nervous systems, although the blood and vascular system, and the muscular structures, may manifest the chief or only lesions.

324. i. ALCOHOL—*spirits of wine—spirituous liquors*, such as *gin*, *whisky*, *brandy*, *rum*, and *arrack*, have been taken in so large quantities as to produce not merely intoxication, but even death, in a few hours. The poisonous operation of alcohol has been ably investigated by Dr. CHRISTISON. In the article DRUNKENNESS, I have described the slowly developed effects and ultimate results of habitual drunkenness; and the articles DELIRIUM TREMENS and *Granular Degeneration of the* KIDNEYS are illustrations of certain other forms of slow or *chronic poisoning* by spirituous and other intoxicating liquors. It will be necessary for me, therefore, at this place to notice only the more *acute forms* of poisoning by alcohol and its compounds.

325. *A.* The *symptoms* of the more acute states of poisoning by alcohol are, violent excitement of the nervous functions, and of the passions or emotions; flushed face; excited vascular action, followed by giddiness; confusion of thought; various mental affections, varying with the character of the individual; delirium; dozing, passing into profound somnolency, which, after several hours, is interrupted by headache, sickness, vomiting, and terminates in a heavy or stupid headache, giddiness, or nervous exhaustion. Such is the more favourable course of severe intoxication; but a more unfavourable result may accrue, either during the stage of vascular excitement, or in the following period of congestion; the somnolency deepening into profound coma, terminating in death. Dr. CHRISTISON furnishes the following illustrations of this state of poisoning. Two brothers drank in half an hour three bottles of porter, into which twenty-four ounces of whisky had been secretly mixed by a companion in order to intoxicate them. In the course of drinking both became confused; and fifteen minutes after finishing the last bottle one of them fell down insensible, and had no recollection of what happened for twelve hours; but he recovered. The other staggered a considerable distance for an hour, and then became quite insensible. In four hours he was comatose; the breathing stertorous and irregular; the pulse eighty, and feeble; the pupils dilated and not contractile, and deglutition impossible. He remained in this state till his death, which took place fifteen hours after this debauch.

326. In this state of acute alcoholic poisoning, an apoplectic tendency may be developed into a true *apoplectic seizure;* and the usual appearances of apoplexy be found within the cranium after death; this seizure occurring either in a simple form, or associated with paralysis, especially hemiplegia. This result takes place either during the somnolent stage,—this state passing into profound coma,—or a partial recovery from somnolency occurs, and apoplexy, either gradually or suddenly, appears after the effects of intoxication have nearly or altogether passed off.—An individual reached his home in a state of intoxication. He became lethargic, and died in the course of twenty minutes. On examining the body, Dr. ALISON could not discover any morbid appearance, except some watery effusion in the ventricles and on the surface of the brain. The contents of the stomach had a strong smell of spirits. This case, however, presents a more rapid course than is usually observed when intoxication passes directly into coma and apoplexy. A man drank thirty-two ounces of rum in the afternoon, and was comatose most of the ensuing night. Next morning, although very drowsy, he was sensible when roused; and in the evening he was convalescent. But, two days afterwards, he became delirious; and in two days more comatose and apoplectic. No other morbid appearances than congestion were found in the brain.

327. In some instances, the lethargy and insensibility caused by acute intoxication is attended by *violent convulsions*, which have presented either an hysterical or an epileptic form. I was called to a female who had drunk a large quantity of

spirits in a short time. She was muscular and robust, violently convulsed, unconscious, and occasionally she uttered the most distressing screams. Recourse was had to the cold affusion on the head, the convulsions assumed more of the hysterical character, and the coma was diminished and soon ceased. In another case, also of a robust female, whom I attended with Mr. Lambert, convulsions of an epileptic character appeared during the insensibility caused by the ingestion of a large quantity of spirits. When I saw her, the symptoms were exactly those of a violent epileptic attack, and, as in the former case, characterized by the strong smell of spirits. The convulsions continued for a long time, and then passed into violent phrenitic delirium, which was not removed for several days; but recovery, complete and lasting, followed cold affusions, and copious local depletions.—A medical student, after drinking four bottles of champagne, during and after dinner, besides some other wines and liquors, became phrenitically delirious. Violent convulsions supervened and recurred at intervals, during which the phrenitic symptoms continued. I saw him about thirty hours after his debauch. The maniacal delirium, and the brief attacks of convulsions, recurred almost hourly, attended by the most intense indications of vascular determination to the brain and its membranes. The treatment about to be recommended was adopted, and he recovered.

328. *B.* A still *more acute state* of poisoning than the above, by alcoholic liquors is sometimes met with. When these liquors are swallowed in large quantity in a very short time, there is seldom much preliminary excitement. Coma occurs in a few minutes, and gradually assumes an apoplectic character. The face is livid or pale—sometimes ghastly; the breathing stertorous, and with a spirituous odour; the pupils dilated and insensible, sometimes contracted; and death often takes place in a few hours. Tetanic convulsions occasionally appear in this form, although not so frequently as in the preceding. Instances of this rapid form of poisoning have been recorded by Orfila, Bedingfield, Marx, and others. Dr. Christison mentions an instance of a man who drank at once a bottle of whisky. He died in four hours with symptoms of pure coma.

329. The effects of alcoholic liquors are greatly heightened, and often to a fatal extent, by exposure to cold either after or during the ingestion of the poison; and intoxication and insensibility more rapidly result. This is owing not only to the sedative influence of cold, but also to the partial or complete arrest of the excretion of the spirituous vapour by the lungs and skin. Most of the accidental deaths which have occurred in this country from exposure to cold during intemperate weather have been caused by a too free use of spirituous liquors just previously to such exposure; insensibility, coma, and death supervening.

330. Numerous instances have occurred, especially in this metropolis, of various liquors containing alcohol, especially malt liquors, having been made the vehicles of other poisons, and given with the intention of robbery or murder. The poisons thus administered have been usually opium or prussic acid — especially the tincture of opium. Such cases may be recognised by the fact that the effects are of a much more severe character than could result from the quantity of alcoholic fluid which had been taken. In these cases, it is often very difficult to decide whether the symptoms are caused more by the alcoholic liquor than by the poison with which it was drugged.

331. *C.* The *appearances observed after fatal acute poisoning by alcohol*, consist chiefly of increased vascularity of the internal surface of the stomach, sometimes with ecchymoses, the villous membrane presenting either a bright red, or a dark brown, or some intermediate hue; of congestion of the brain; of an increased quantity of fluid in the ventricles and between the membranes; and sometimes of effusion of blood in the substance of the brain, or between the membranes, or of a bloody serum in the latter situation. When death takes place rapidly, a strong odour of spirits may be perceived in the contents of the stomach; and in less rapid cases this odour has been said to have been perceived in the serum effused within the cranium; but this may not be felt if some time has elapsed before the inspection has been made. (See art. Drunkenness, § 8.)

332. *D.* The *quantity* required to destroy life cannot be determined. Much depends upon the age, habits, &c. of the individual, upon the state of the stomach, and upon the treatment. Young persons, not accustomed to spirits, may be killed by a comparatively small quantity. Mr. Taylor adduces the following: A boy, aged seven years, swallowed three ounces of brandy. Shortly afterwards he was observed to stagger. He was sent to bed, and vomited violently. In about four hours he was in a profuse perspiration, and his head, face, and neck were very red. Half an hour afterwards he was found insensible, strongly convulsed, and the skin cold. He died in about thirty hours. Addiction to spirituous liquors often enables the system to tolerate a large quantity without much effect. A large powerful young man, thus addicted, in the presence of the author, swallowed for a bet a bottle of rum within half an hour. He was hardly affected by it. A full stomach previously to the ingestion of spirits also affords a greater tolerance of this poison.

333. *E.* The *period* which elapses from the ingestion of the spirits until death occurs also varies with the circumstances just mentioned. Mr. Taylor states that the shortest period which he has seen reported, occurred in a case of a man who swallowed a bottle of gin for a wager. In a quarter of an hour afterwards he became intoxicated, and soon after that insensible, and died in *half an hour*, although a large quantity of the spirit had been removed by the stomach-pump. Dr. Chowne adduced an instance of a boy, aged eight years, who was found insensible half an hour after having taken about half a pint of gin. The liquid drawn off his stomach seven hours afterwards had no odour of gin, nor was the odour of it perceptible in his breath. He was insensible and motionless; the limbs relaxed and powerless, the face pale, and the surface cold. The pulse was quick and feeble. He died without rallying or recovering consciousness *sixty-seven* hours after taking the poison.—On *inspection*, the brain was found healthy. There were slight effusion of serum, and distension of the veins of the pia mater. The stomach was pale. No exact *period* can be assigned for the fatal termination of the effects of

this poison; this termination depending chiefly upon the absorption of the spirit into the circulation, and upon the rapidity and extent of the absorption—the quantity accumulated in the blood, especially when the kidneys, lungs, and skin do not rapidly excrete it, suppressing the cerebral functions and impairing the irritability, and ultimately arresting the action, of the heart.

334. *F. Treatment.* — The contents of the stomach should be withdrawn by the stomach-pump as speedily as possible; and the cold affusion ought to be resorted to immediately, in order to remove the symptoms of intoxication, or the insensibility or coma which may have already appeared. Previously to 1822, the treatment of dangerous cases of poisoning by alcoholic liquors, as well as those by narcotics, was not understood, and was certainly far from being successful. In July of that year, cases demonstrating the good effects of the cold affusion on the head in poisoning by these agents, were published by Mr. WRAY and myself (*Lond. Med. Repos.* vol. xviii.); and the efficacy of the practice in cases of poisoning by spirits has been vouched for by Dr. OGSTON in an able memoir on intoxication. He states that, where the temperature of the head is steadily high, and that of the surface not much reduced, it is a safe and efficacious remedy.

335. Having removed the contents of the stomach and used the cold affusion, the liquor ammoniæ acetatis with the ammonia in excess should be freely given in camphor water. Cases are comparatively rare which admit of blood-letting or even of local depletions. In young, robust, and plethoric persons, not accustomed to intoxication, and when the affection of the brain is of a phrenitic character, then vascular depletions are often required; but they should be resorted to with caution, and their effects carefully watched. When the insensibility and coma are profound, and when they resist the cold affusion on the head, the liquor ammoniæ acetatis, with the carbonate of ammonia and camphor water should be given; and if deglutition cannot be effected, they ought to be conveyed into the stomach by the stomach-pump, or administered in enemata. Warmth, and the promotion of a free perspiration, are always beneficial. In other respects the treatment is the same as described in the articles DRUNKENNESS, and DELIRIUM WITH TREMOR; the more *chronic states* of poisoning by alcohol being there discussed, especially under the former of these heads.

336. ii. THE ÆTHERS—especially the *sulphuric*, the *nitric*, and *hydro-chloric*, may occasion dangerous or fatal effects when taken in excessive quantity, or when their vapours are too long *inhaled*. —*A.* When taken into the stomach, the operation of the æthers is analogous to that of spirituous liquors. M. ORFILA performed several experiments with them on the lower animals; but as these were accompanied with placing ligatures on the œsophagus, little importance can be attached to the results. I am not acquainted with any dangerous effects which have occurred from swallowing any of these æthers; and I believe that they may be taken in larger doses than they are usually prescribed, and be productive, in certain states of disease, of much benefit.

337. *B.* The *inhalation of æther*, especially the sulphuric, has lately come into vogue for the abolition of sensibility, in order that surgical operations may be performed with comfort, and even pleasure, to the patient. But it appears doubtful to me, after witnessing several instances of the inhalation of æther, whether or not the risks contingent on it do not more than compensate for the escape from pain during an operation. The inhalation of æther to the extent of annihilating, even for a very short period, the sensibility, must necessarily be attended by changes in the nervous system; and even in the blood, otherwise a most important function,—and one presiding over and directing all our animal functions,—could not be entirely subverted for a time; and it may be inferred *à priori* that congestions of the brain and medulla oblongata, congestions and inflammations of the bronchi and of the lungs, and alterations of the blood, especially as regards the red globules and fibrin, will result from the passage of so large a quantity of æther into the circulation as is usually required to produce insensibility; and I believe that these results have actually accrued already, in some instances, from the practice; and that, although matters may have proceeded favourably as respects the operation, congestive bronchitis or congestive pneumonia has nevertheless been developed by it; whilst the absorption of purulent matter, and the occurrence of phlebitis, after great operations have been favoured by it, by lowering the general amount of vital resistance, by affecting the constitution of the blood, and by weakening the tone of salutary vascular re-action.

338. The attempts recently made to introduce the *inhalation of æther* into general practice for the alleviation of the *pains of parturition*, as well as for trifling operations and unimportant occasions, are fraught with some danger; and I am confident that a further experience will prove my predictions to be correct. I may here explicitly state what the danger is, as regards the *puerperal state;* namely, the supervention of *convulsions*, of *hæmorrhage*, *maniacal delirium*, *puerperal fevers*, sinking of nervous power in various ways, but especially in the form of cardiac *syncope*, and inflammations of the *respiratory organs*, or of the *brain*.

339. Instances were, a few years since, published of a druggist's maid-servant having been found dead in bed, owing to the air of her apartment having been loaded with the vapour of nitric æther by the breaking of a jar containing a large quantity of this substance. She was found lying on her side, with her arms folded across the chest, the countenance and posture composed, and her whole appearance that of a person in deep sleep. The stomach was found red internally, and the lungs were gorged. The brain was not examined.—A young man was found completely insensible from breathing air loaded with sulphuric æther, and remained apoplectic for some hours.—I am acquainted with an instance of similar effects having accrued, from the vapour of strong spirits having been inhaled whilst the person was transferring the contents of a large cask into bottles.

340. *C.* The *treatment* of insensibility caused by æther is not materially different from that produced by ardent spirits. The cold affusion on the head and neck is the most to be confided in, if the case be in any way alarming.

341. iii. CAMPHOR.—There are few substances

the action of which is more variable, according to the dose, the mode of exhibition, state, and constitution of the patient, &c. than camphor. Hence its operation has been differently described, and its employment in disease has not been always judicious or beneficial. Having been in the habit of prescribing it, often in large doses, in various dangerous diseases, I was induced, on two occasions, to take a considerable quantity, in order to ascertain its effects from my own sensations; and on several other occasions I have taken smaller doses. These experiments were made chiefly in 1823 and 1824, and the results were published in the *London Medical Repository* for September, 1825.

342. *A.* The *vapour* of camphor is injurious to insects; and when long inhaled by man, it occasions headache, pallor of the countenance, slight irritation of the respiratory mucous surfaces, followed by slight reaction of the circulation, especially in the brain and lungs. — *Locally*, on the *denuded dermis*, or on the *mucous surfaces*, it appears to impress the nerves of the part; and, after rendering the part at first pale, it increases capillary injection and redness, and developes moderate vascular reaction in it. Whether applied to the skin denuded of its cuticle, or taken into the stomach, or injected into the rectum or other mucous canals, camphor is readily *absorbed* into the circulation, and is eliminated from it chiefly by the lungs and skin, and not perceptibly by the urinary organs, although it is believed to affect those organs.

343. *B.* The *primary action* of camphor is exerted chiefly through the medium of the nervous system; but *consecutively*, and as it becomes *absorbed* into the circulation, its action is more fully manifested on the brain, on the heart and vascular system, and on the lungs, especially on the bronchial mucous surface, as it is eliminated by the respiratory organs from the blood. The following are the results of my experiments with this substance above alluded to (§ 341.).

344. Camphor produces effects varying with the dose, and the period which elapses from the administration of it. When taken into the stomach, triturated with oil, or divided minutely by means of mucilage, magnesia, &c., fifteen grains produces the effect of half a drachm given in the form of pills or bolus, or less minutely divided; and this latter quantity sometimes produces, especially when the stomach is empty, and taken in oil or much diffused in mucilages, &c. and in certain constitutions, very severe effects. Given, therefore, in doses of from fifteen to thirty grains, diffused in mucilage, it produces the following effects, which, as they are progressively different, may be divided into *three stages*.

345. *a.* In the quantity just mentioned, camphor occasions a peculiar sensation of heat and constriction in the throat, and along the œsophagus as it is swallowed, followed by a similar feeling, attended by slight anxiety, at the epigastrium and region of the stomach. The sensations of internal heat and of concentration or constriction in this situation continue for some time, and are attended by slight thirst, a more constricted and slightly accelerated pulse, and a colder state of the extremities. The surface of the body also becomes cooler, and a sense of chilliness and of coldness, greater than the actual loss of temperature, is produced; yet there is, at this time, a feeling of internal warmth and excitation, as if the energies of more remote parts were drawn towards the stomach. To these sensations are added pallor of the countenance, vertigo, pandiculation or slight rigors. The head is cool, the action of the carotids somewhat diminished, and the respiration slow or natural.

346. *b.* In from one to two hours, the constriction and diminished action of the surface and extremities have passed off, and replaced by more or less reaction and determination of blood to the head and periphery of the body. The pulse becomes fuller and stronger; animal heat is increased; the features are more developed, and the colour returns or is increased; the vertigo, pandiculation, chilliness, and rigors having disappeared. Shortly afterwards headache, flushed face, excited pulse, sometimes noises in the ears, various but slight affection of sight, watchfulness or slight mental excitement, or delirium and disturbed sleep, in some instances, are experienced.

347. *c.* These effects having continued a few hours, the excitement of the pulse and of the brain subsides, the heat of the skin passes into a free perspiration; the pulse becomes slower and softer, and a refreshing sleep terminates the headache and slight disturbance of the brain and organs of sense; and the nervous and muscular systems remain composed. These are the usual effects of a large dose (from fifteen to thirty grains) of this substance upon a healthy person, when it is not repeated. Where smaller quantities are taken every four or five or six hours, the effects constituting the second stage are chiefly manifested to an extent in proportion to the amount of the doses. When dissolved in oil or in spirits, it appears to act with greater activity, and to be more readily absorbed into the circulation, where, if the dose be large, or if the doses are repeated at short intervals, it acts energetically upon the nervous system, overexciting the brain, and causing maniacal delirium, and even convulsions and death. It seems also to possess antiseptic properties.

348. *C.* The *smallest quantity*, which has produced symptoms similar to the above, calculated by their severity to cause alarm, is *one scruple*. I have often, however, given this quantity, and repeated it a second and a third time at intervals of six and eight hours, with marked benefit, in low and malignant states of fever. When given in an enema, and in a state of minute division, it often acts with great rapidity, and sometimes with great severity. Dr. CHRISTISON adduces a case where half a drachm was thus administered, and severe nervous symptoms were produced. I have often prescribed as much as this, but never more, in an enema, for insensibility or profound coma, and either alone or with assafœtida; and it has sometimes been efficacious, but never injurious. In a case of most profound and protracted coma, in which deglutition was abolished, to which I was called with Mr. KINODON and another practitioner, this substance, administered in an enema, in a very large dose, roused the patient, and procured ultimate recovery. Mr. TAYLOR adduces a case by Dr. SIEMERLING, in which a man, aged sixty-nine years, swallowed *two drachms* for the relief of rheumatism. Three hours afterwards he resembled a drunken person. He complained of burning heat in the throat and stomach, of throbbings in the head, and pains in the course of the

spine; of ringings in the ears, and dazzling light before his eyes. To these succeeded subsultus tendinum and insensibility, and profuse perspiration. This last state was, however, of short duration; and he slowly recovered.

349. Dr. WENDT mentions a case, in which eight scruples were taken dissolved in spirit — the *largest dose* hitherto mentioned. Vertigo, dimness of sight, delirium, and burning pain in the stomach, but no vomiting, were the only symptoms. The man who took this quantity was an habitual drunkard; but he recovered. I have often found that drunkards may take large quantities of this substance without producing any unpleasant symptom; and I have given it in very large doses (from ten grains to one scruple) with opium for the delirium of drunkards, with marked benefit.

350. *D.* The *appearances* occasioned by poisonous doses of camphor have not been observed in man. According to the experiments of ORFILA and SCUDERY, the mucous membranes of the stomach, duodenum, and urinary organs were inflamed, and the membranes of the brain injected. The other appearances were less constant. All the cavities had a strong smell of camphor.

351. *E. Treatment.*—When the effects of camphor are not very severe, they soon pass off. But when they become alarming, whatever of this substance may still remain in the stomach should be removed by an emetic or by the stomach-pump, and demulcents with opiates, or henbane, or poppies, and the cold affusion on the head, or the shower-bath, ought to be resorted to, if maniacal delirium supervene. If convulsions or insensibility appear, the cold affusion, injections with assafœtida or ammonia, and other stimulants may be administered. If strangury occur, demulcents and emollient enemata are generally of the greatest service.

352. iv. CHELIDONIUM MAJUS and C. GLAUCIUM produce inflammation of parts to which they are applied; but they appear to be partially absorbed, and to act upon the nervous system, causing delirium, in cases where they have been partaken of by mistake. In M. ORFILA's experiments, they occasioned remarkable congestion of the lungs, whether taken into the stomach, or applied to wounds.

353. v. HEAT, in its various forms and appliances, may be very briefly considered under the present category, as it may become more or less rapidly injurious, or even destructive of life. — *a. Atmospheric heat*, or the *temperature of an apartment*, may be so high as to interfere with the respiratory functions, to impede the decarbonization of the blood; to excite, and ultimately to exhaust, the nervous energy; to change the state of the blood; and, lastly, to disorder all the excreting functions, and to arrest the vital actions. When, with a high range of temperature, the living body is exposed to a stagnant state of the air, when there is not a sufficiently rapid renewal of the atmosphere, then the noxious effects are produced with a rapidity co-ordinate with the degree of atmospheric stillness; and asphyxia is produced with proportionate celerity. But when the elevation of temperature is not so great, although still high, nor ventilation so imperfect, then the deleterious changes are less rapid, and assume a slow form, inducing various *chronic affections*, more especially of the liver, stomach, and bowels, and often also of the spleen. Fatty liver, various states of enlargement and chronic change of this organ, bilious fever, &c., are not infrequent consequences of this cause; and very frequently occur, even among the inhabitants of cold regions, who shut themselves up in close apartments, warmed by stoves, during the cold seasons.

354. It is important to remark, although the circumstance must be obvious, that the air, when raised to a high temperature by the usual means resorted to in factories, — by heated air, by steam, or hot water transmitted through metal pipes to different parts of the building, — readily becomes stagnant, and that due ventilation is with difficulty preserved in connection with this mode of warming, although the great numbers of persons usually employed in these places require a more than usually rapid renewal of the air. The consequences are, that the persons there employed rapidly vitiate, or even poison the air which they breathe, independently of any deleterious miasm which may be generated by the articles, materials, apparatuses, or appliances used in these manufactories.

355. *b. Warm baths, vapour-baths, fumigating baths.* — Medicated baths, and various natural *warm or mineral baths*, although beneficial when appropriately resorted to, may nevertheless become, owing to their exciting and exhausting influence, most deleterious in various states of the system, even in health, and still more so in several diseases. What is a most successful medicine when judiciously employed, becomes either a rapid or a slow poison when it is not appropriately prescribed.

356. Heat applied to the external surface in such excess as to produce scalds or burns, especially when an extensive surface is implicated, is productive of danger or death, not so much by the extent or severity of the local injury, as by the sympathetic development of inflammation of mucous or serous surfaces, and its consequences.

357. *c.* The injury produced by swallowing hot or *boiling fluids* is dangerous or fatal, according to the amount or seat of local lesion. When the fluid is of a temperature as high as 200° or 212°, it rarely gets lower than the upper part of the gullet, and the injury is generally limited to the pharynx, epiglottis, and larynx. Accidents sometimes occur from drinking hot or boiling water from a tea-pot or kettle; and Dr. M. HALL has adduced the accounts of four such which occurred to children; and, in all, *cynanche laryngea* was produced. Two of these cases terminated by suffocation, one was relieved by tracheotomy, but died soon afterwards, and the fourth recovered after having been nearly choked. (*Trans. of Lond. Med. and Chirurg. Soc.*, vol. xii. p. 1.)

358. vi. *A.* IPECACUANHA has been considered by some as an *irritant*, and by others as an *acro-narcotic*: but, strictly speaking, it cannot be viewed as either — not as an irritant, as it does not irritate or inflame the capillaries of the surfaces to which it is applied; — nor as a narcotic, for it does not stupify. Its impression is primarily upon the nervous organisation of the part to which it is applied, and is rapidly followed by muscular contraction or reaction, when the quantity of the substance is such as to produce an impression sufficiently strong

to develop this effect. — The susceptibility of the influence of this substance is remarkably great in some persons — so much so as to occasion the most distressing effects. When this susceptibility is great, even the presence of a few grains of ipecacuanha in the same apartment as the person thus constitnted is sufficient to produce a sense of suffocation, tightness in the chest, nausea, depression, or faintness, or other disorder, varying with the idiosyncrasy of the individual; but the most frequent affection is one resembling asthma. I have met with several persons who are thus affected by the odour of ipecacuanha, or by the impalpable powder of this substance, when any of it is inhaled; and seen two instances of most distressing suffering produced by it. It is not unusual, also, even when this susceptibility of the effluvium of the drug does not exist, to meet, in the course of medical practice, with persons upon whom very minute doses of any of the preparations of ipecacuanha produce more or less distress, especially nausea, retching, and depression.

359. *B. Emeta.* — The active principle, or alkaloid of ipecacuanha, whether taken into the stomach, or applied to a wound, occasioned, in the experiments of MAGENDIE, death after some hours, preceded by vomiting and coma, the lungs and stomach being found inflamed.

360. *C. Treatment.* — It is rarely that any thing more than time is required to remove the effects of ipecacuanha; for an overdose of it is prevented from becoming injurious by its immediate rejection from the stomach. It is chiefly when, owing to idiosyncrasy, its more distressing effects are produced, that treatment is requisite. In the cases which I have treated, an open, free, and warm air, camphor with henbane taken in demulcents, and a warm mustard poultice applied over the lower part of the sternum and the epigastrum, soon removed the disorder. When nausea, retchings, and depression occur from small doses of this substance, or when the operation of it becomes exhausting or too prolonged, then small doses of ammonia and créosote, or this latter in an aromatic and emollient draught, will afford relief.

361. CLASS IV. — EXCITING AND CONSTRINGING POISONS. — *Nervous and Muscular Excitants.* — Although numerous medicinal substances act more especially upon both the nervous and the muscular or contractile systems, yet there are comparatively few of them which act so violently upon these systems as to produce death, unless they are employed improperly in the treatment of diseases, and aggravate existing morbid conditions, by interrupting the salutary efforts of nature, and by arresting or preventing the evacuation of hurtful or contaminating matters. Several substances, whilst they more or less excite the nervous and contractile tissues, become materially or chemically combined with the parts with which they are brought into contact, more especially with mucous membranes, by which they are readily imbibed. Tannin, gallic acid, and the gallates, krameria, alum, kino, catechu, solutions of several of the mineral salts, &c., whilst they excite nervous and contractile parts, and thereby produce a tonic effect, are partially imbibed by, or combined with, the tissues to which they are applied; and although this latter operation is not very manifest in the living textures, it is sufficiently demonstrated in dead animal matter, which is thereby preserved from decay for longer or shorter periods. The constringing influences of these and of similar substances are displayed more upon the exhaling and secreting surfaces, to which they are applied than upon remote structures and organs; but when the quantity is more considerable, or when the dose is often repeated, they are then more abundantly imbibed and absorbed into the circulation, and act more or less energetically upon the nervous centres and contractile parts. Most of these substances, however, are not poisonous unless they are taken in excessive quantities, or are employed inappropriately in certain states of disease.

362. But there are some of them which are amongst the most virulent poisons in nature, and are exceeded only by prussic acid in their poisonous influences. These substances act chiefly by exciting the nervous systems, the excitement being propagated to the spinal chord, and reflected thence upon the muscular system, the irritability of contractile parts being inordinately excited, and being followed by various consequences according to the persistence or the exhaustion of the excitement, and to the parts more especially affected. These substances generally increase the sensibility, and in this respect chiefly they differ from narcotic or stupifying poisons. They do not paralyse or diminish muscular contraction, but on the contrary inordinately excite this function, so as frequently to become incompatible with the continuance of life, tetanic asphyxia being often the more immediate cause of death. They produce no visible change in the tissues to which they are applied, or in the alimentary canal, or if any change is observed it is accidental, not necessarily connected with the operation of the poison, and insufficient to account for any portion of the phenomena or symptoms they produce. They act chiefly, by being absorbed, and through the medium of the circulation, upon the nervous centres, more especially upon the spinal cord; and they owe their activity to an alkaloid principle which is poisonous in an extremely small dose.

363. i. ALUM. — *Sulphate of alumina and potash* can hardly be considered as a poison, although it may prove injurious when taken in very large quantity or in various disorders. It acts as an excitant and astringent; and is absorbed into the circulation; whence it is excreted chiefly by the kidneys. Its beneficial operation in lead colic is owing to its exciting the organic nervous and muscular structures of the digestive canal. M. ORFILA has detected this substance in the stomach, liver, spleen, and urine.

364. ii. NUX VOMICA — STRYCHNIA, &c. — Several species of the genus *Strychnos*, namely, *S. nux vomica*, *S. Sancti Ignatii*, or St. Ignatius' Bean, *S. Colubrina*, *S. Guianensis*, *S. Tieuté*, which yields the *Upas Tieuté*, an Indian poison, &c., are extremely active poisons, and owe their activity to an alkaloid principle which has been called *Strychnia*, or *Strychnine*. This substance has an intensely bitter taste, perceptible even when one grain is dissolved in 80 lbs. of water. It is sparingly soluble in water, but more abundantly in alcohol and the volatile oils. It exhibits an alkaline action, and forms neutral anderystallizable salts with the acids. Dr. CHRISTISON

killed a dog in two minutes with 1-6th part of a grain injected in the form of an alcoholic solution into the chest. He has seen a wild boar killed in the same manner with a third of a grain in ten minutes. There is little doubt that half a grain introduced into a wound might kill a man in a few minutes. It acts most rapidly and energetically when a solution of it is injected into a vein.

365. *A.* The *symptoms* produced by strychnia are uniform and striking, when this substance is applied in a large poisonous dose. The animal is at first agitated, and is soon afterwards seized with startings and stiffness of the limbs, which increase until it is attacked with a fit of violent general spasm, in which the head is bent back, the spine stiffened, the limbs extended and rigid, and the respiration checked by spasm of the respiratory muscles. An interval of calm succeeds, during which the sensibility is generally more than usually acute, and the senses unimpaired; but another paroxysm soon follows, each successive attack being more severe, and the intervals shorter, or less marked, until at length the severity of the fit, and the duration of the spasm of the respiratory muscles terminate in suffocation. Dr. CHRISTISON has observed the first symptoms of this poison in from 60 to 90 seconds after the application of it to a wound; and 45 seconds after its injection into the pleura. MM. PELLETIER and CAVENTOU have seen them appear after 15 seconds, when injected into this cavity. M. BOUILLAUD says that it has no effect when applied directly to a nerve.

366. *B.* As to the *quantity* of strychnia likely to destroy life, much will depend upon the mode of application, and its administration in a dissolved or undissolved state. There is no doubt that one half, or even one third of a grain, when dissolved and injected into a vein, would be sufficient to destroy a man. Three eighths of a grain given medicinally produced violent tetanic convulsions, spasms of the extremities, trismus, opisthotonos, spasmodic contraction of the respiratory muscles, &c. Dr. PEREIRA has given the particulars of a case which favours the idea that strychnia, like digitalis, accumulates in the system, and suddenly occasions violent symptoms after the exhibition of it in small and frequently repeated doses; and which demonstrates the poisonous operation of this substance in man.—A Swede, between fifty and sixty years of age, suffering from general paralysis, one side being more affected than the other, took one eighth of a grain of strychnia three times a day for some weeks, without effect. The dose was increased to one quarter of a grain thrice daily, also without effect. It was further increased to half a grain, twice or thrice a day; and this dose was taken for some days before the effects of this substance were manifested. The patient was found in a fit. The whole body was in a state of tetanic spasm; the trunk and limbs were extended; the shoulders thrown back; the muscles rigid and hard; the face and chest were of a purple colour; respiration had ceased, and the pulsation of the heart was very weak. Artificial respiration was imperfectly kept up by compressing the thorax; and the circulation was somewhat restored. The deep purple colour of the face went off. The man sighed and the respiration returned; but the spasms very soon appeared with increased violence, and attacked the respiratory muscles. Respiration entirely ceased the surface again became purple, but the circulation still went on. Artificial respiration was continued imperfectly, when the relaxation of the muscles would allow of it; but was this time ineffectual. The heart soon ceased to beat, and the purple colour of the surface was instantly replaced by the pallor of death.

367. A young man swallowed forty grains of strychnia. The symptoms commenced in a quarter of an hour. Trismus and spasm of all the muscles speedily appeared, and the whole body became as stiff as a board. The lower extremities were extended and stiff, and the soles of the feet concave. The skin became livid, the eyeballs prominent, the pupils dilated and insensible, and the patient lay in a state of universal tetanus. A remission occurred, but the symptoms soon became aggravated, and the patient died asphyxiated owing to spasm of the muscles of respiration, in about an hour and a half after taking the poison. On inspection, twenty hours after death, the body was very rigid. There was affusion in the spinal sheath [probably only the spinal fluid], and the upper part of the spinal marrow was softened; the brain was congested, but the alimentary canal was in its normal state. —(*Lancet, Jan.* 27. p. 647. 1838.)

368. Mr. FRENCH informed Mr. TAYLOR that a person took a grain of strychnia at a dose. Vomiting occurred, and no ill effects were produced; but half this quantity may give rise to dangerous symptoms, when taken for the first time. When commenced with in small doses and gradually increased, the system may become gradually habituated to its influence, until a large dose is reached, when its effects may be suddenly and fatally manifested, as in the case mentioned above (§ 366.).

369. The operation of *strychnia*, or of its *salts*, or of any of the substances which contain this poison, should not be mistaken for *tetanus*. This disease is developed much more slowly, and death takes place after a much longer time, than in cases of *acute* poisoning with any of these poisons. But if the dose be small and frequently repeated, a much less acute form of poisoning may be produced, and one which may, with great difficulty, be distinguished from tetanus. An attempt was made to defraud insurance offices in London, by insuring the life of a young woman very largely, and destroying her by administering strychnia in porter.

370. *C. Nux Vomica*, the *Bean of St. Ignatius*, the *Upas Tieuté*, the *Wourali poison*, and the other substances enumerated above (§ 364.), owe their poisonous properties to *strychnia*. St. Ignatius's bean is said to contain nearly three times the quantity of this alkaloid found in nux vomica. But this last substance is most frequently employed as a poison. The symptoms produced by it are similar to those caused by strychnia, but are less severe. Nux vomica is usually taken in the form of powder. It has an intensely and persistent bitter taste; and generally tetanic spasms appear in from five to twenty minutes after it has been taken. The symptoms are altogether the same as have been described, and death is produced by the asphyxia consequent upon the spastic contraction of the thoracic muscles.

371. MR. BAKER states that *nux vomica* is taken by many of the nations of Hindostan habitually,

generally night and morning, beginning with an eighth part of a nut, and gradually increasing the dose to an entire nut, or about twenty grains. If it be taken immediately before or after a meal, it never occasions any ill effects; but if this precaution be neglected, spasms are apt to ensue. As this substance is taken in a state of coarse powder, and not in greater quantity than one nut, and frequently after having been half roasted, it is probable, that it is only slowly acted upon by the juices of the stomach; and that the modifying influence of habit as regards it is not considerable. Mr. BAKER adds that it is thus used as a preservative from lepra and some other chronic disorders; but it is more likely that it is taken on account of its tonic and aphrodisiac properties. The habitual use of this substance proves that the cumulative influence imputed to it above does not exist.—(*Trans. of Med. and Phys. Soc. of Calcutta*, vol. i. p. 140.)

372. *D.* As *nux vomica*, in *powder*, in *extract*, and in *tincture*, is an excellent remedy in several disorders, and is frequently used medicinally, the *symptoms* indicating its injurious operation should be more fully described. When large doses are given, the stomach often becomes disordered, the appetite impaired, and the bowels constipated. The muscular system and the sensibility are next affected. All the senses are more than usually acute. The sensibility of the surface to cold, or to slight touch, is remarkably acute; and depression of spirits, anxiety, and a feeling of weakness and weight in the limbs are complained of. Mr. PEREIRA remarks that the limbs tremble, and slight rigidity or stiffness is felt upon motion. The patient staggers, and, when he stands, a slight tap on the ham brings on a convulsive motion, which nearly throws him down. If the medicine be persevered in, these effects increase, and the voluntary muscles are thrown into a convulsed state by very slight causes. The sudden contact of external bodies acts like an electric shock upon him, and produces a convulsive paroxysm. A deep inspiration, turning suddenly in bed, startling sounds, &c., have a similar effect. The further use of nux vomica renders the symptoms still more intense; the fits of spasm now occurring spontaneously, and without any of these provocations. It acts upon the bladder and genital organs, and exerts an aphrodisiac effect on both sexes. The pulse, however, is but little increased in frequency, and is sometimes calm even when muscular rigidity has appeared. Preceding and accompanying these effects, great sensibility of the surface, painful formications, and acuteness of the senses are experienced. The intellectual powers are unimpaired. If the use of this substance be continued, especially in an increased dose, the symptoms are still more violent, and tetanus, tetanic asphyxia, and death succeed each other with great rapidity, as they follow large doses of *strychnia* (§ 365.).

373. *a.* Dr. CHRISTISON states the smallest *quantity* of nux vomica likely to produce death to be three grains of the alcoholic extract; which is not so small a dose as fifteen grains of the powder, which was fatal in a case adduced by Dr. TRAIL. Thirty grains taken in two doses caused death; and fifty grains (equal to a quarter of a grain of strychnia) were fatal in an hour.

374. *b.* The *period* after the ingestion of the poison at which death usually occurs is generally from one to two hours, but Dr. CHRISTISON mentions a case that terminated in fifteen minutes. When this poison destroys life within a few hours, or in still shorter time, vomiting rarely occurs, and the patient dies from the tetanic asphyxia. But when death does not take place thus suddenly in a fit of spasm, the person continues to be affected for twelve or eighteen or twenty-four hours with similar or milder paroxysms, and may expire from exhaustion, or entirely recover. A fatal termination by exhaustion is not, however, so frequent as that by asphyxia. M. J. CLOQUET met with a case of fatal exhaustion consequent upon the violent and repeated spasms produced by this substance. The tetanic fits returned for more than twenty-four hours, the sensibility being very acute. Death did not take place until the fourth morning.—(*Nouv. Journ. de Med.* t. x. p. 157.)

375. *c.* There are several instances of recovery on record. SOBERNHEIM states that a young man took half an ounce of this powder, and experienced the usual symptoms. After the administration of emetics he recovered. Dr. BASSEDOW has recorded a similar case; recovery following the operation of emetics. Mr. BAYNHAM states that a girl swallowed half an ounce of the powder; the usual symptoms appeared, but the treatment having been prompt, they subsided in about four hours from their first appearance, and the next day she was only feeble and exhausted. He says that he has often prescribed a scruple of nux vomica three times a day without any ill effects! In this, as well as in other cases, there was neither vomiting nor purging until they were produced by the treatment. A strong dose of sulphate of zinc caused free vomiting in a few minutes. — (*Lond. Med. Gaz.* vol. iii. p. 445.)

376. *E. Appearances after death.*—These vary with the rapidity with which death takes place, and the period after death at which the body is examined. In a case recorded by Mr. OLLIER, death took place in an hour, and the changes were slight. The stomach was almost natural, although between two and three drachms of the powder of nux vomica had been taken. The vessels of the brain were somewhat congested; the heart flaccid, empty, and pale. In a case which was rapidly fatal, detailed by M. OLLIVIER, and examined by him and ORFILA, the body was found remarkably rigid, although not less than forty hours had elapsed since death. The more depending parts of the external surfaces were purplish. Much serous effusion was found on the surface of the cerebellum, and softening of the whole cortical substance of the brain, but especially of the cerebellum — this case confirming the opinion of FLOURENS, that nux vomica acts especially on the cerebellum. The lungs were congested with black fluid blood. — (*Archives Génér. de Med.* t. viii. p. 18.) — In a case mentioned by Mr. TAYLOR, a quantity of the powder was found in the stomach, to the internal surface of which it adhered tenaciously. The vessels of the brain were congested. No other changes were noticed. The spastic contraction of the muscles seems to pass into the state of cadaverous rigidity after death, without intermediate flaccidity.

377. *F. Treatment.*—The most efficacious treatment of poisoning by the substances containing strychnia is an immediate recourse to the stomach-

pump, and, if this apparatus is not at hand, to the more powerful emetics. Dr. CHRISTISON remarks, that, when nux vomica in powder has been taken, it adheres tenaciously to the inner surface of the stomach, and that the means used to evacuate the stomach should therefore be assiduously continued. Emetics may not act, as in Mr. OLLIER's case, therefore they ought not to be solely confided in. If the patient be not attacked with spasms in two hours, he may be considered likely to recover. In cases of poisoning with *strychnia*, the efficacy of any treatment is very doubtful, for the quantity which is poisonous is so small, and its absorption so rapid, that means must be instantly resorted to in order to be efficacious. Dr. CHRISTISON quotes M. DONNÉ, who states that he has found iodine, bromine, and chlorine to be antidotes for poisoning for this, as well as the other vegetable alkaloids; these substances, he says, forming, with the alkaloids, compounds which are not deleterious, and which, being in chemical union, are not readily decomposed. Animals, he states, which had taken one grain of strychnia, or two grains of veratria, did not sustain any harm, when tincture of iodine was administered immediately afterwards; but the delay of ten minutes in the administration of the antidote rendered it useless. Further evidence is required as to these antidotes. Dr. PEREIRA remarks, that probably astringents, as infusions of galls, green tea, &c., would be serviceable. To relieve the spasms, narcotics may be employed. SACHS and others have recommended opium. As conia is the counterpart of strychnia, it deserves a trial. Dr. PEREIRA applied it to a wound in a rabbit affected with tetanus from the use of strychnia; the convulsions ceased, but the animal died. In the absence of conia the extract of hemlock may be tried. To relieve the symptoms consequent upon the endermic application of strychnia, acetate of morphia applied to the same part has given relief. — (PEREIRA, Op. cit. p. 1306.) — In a case in which I pushed strychnia so far as to occasion severe spasms, spirits of turpentine were applied with tincture of opium in the form of an embrocation along the spine, and were administered in enemata with assafœtida, and the spasms very soon disappeared.

378. iii. BRUCIA — *Brucia antidysenterica* — or *false Angustura bark.* — This vegetable alkaloid causes symptoms of the same kind as strychnia. According to AMDRAL, brucia is twenty-four times less powerful than strychnia; but the bark itself appears to be nearly as strong as nux vomica. Professor MARC took an infusion of this bark in mistake for true Angustura; and, although the dose was only three fourths of a wine-glassful, yet he was seized with nausea, pain in the stomach, giddiness, sense of fulness in the head, ringing in the ears, stiffness of the limbs, pain on every attempt at motion, locked jaw, difficult articulation, &c. These symptoms continued two hours, and abated under the use of æther and laudanum. Dr. EMMERT states, that a boy who died from taking this poison experienced so distressing a state of sensibility in the intervals between the spasms, that he begged not to be touched, as he was thereby thrown into a paroxysm. This physician has investigated the operation of this poison, and he believes that it acts directly on the spinal cord, and not through the intervention of the brain. In his experiments division of the medulla oblongata, artificial respiration being kept up, or division of the spinal chord, did not prevent the effects of the poison from being manifested in the parts supplied with nerves below the division. The *symptoms* and *treatment* of this poison are the same as those of strychnia, and of the substances which contain it. There are few other substances which are productive of death by operating in such a manner as to bring them under the present category; but the *cocculus Indicus*, and the *coriaria myrtifolia*, appear to possess properties in many respects similar to the foregoing.

379. iv. COCCULUS INDICUS. — *The berries or fruit of the anamirta cocculus.* — Cocculus Indicus is poisonous to all animals. It acts on the cerebro-spinal nervous and muscular systems, causing tremblings, staggering, tetanic convulsions, and death. It does not appear to increase the sensibility; and the coma observed is rather the result of the exhaustion of vital influence by it, than of any narcotic property, which is only produced when the dose is large, and at an advanced period of its operation. ORFILA says, that this poison acts like camphor on the nervous system, and principally on the brain. M. GOUPIL states, that it communicates its poisonous properties to fish, which have been killed by it, and more especially to barbel. It is frequently added to malt liquors for the purpose of increasing their intoxicating powers. Its active principle has been called *Picrotoxine*. Dr. PEREIRA observes that, from accounts he received from an excise officer, the action of this poison is exerted more upon the voluntary muscles than upon the intellectual powers; and that, notwithstanding the severe prohibitory statutes against the employment of cocculus indicus in brewing, there is every reason to believe that it is extensively used; but a solution of the extract being employed, the detection of it is rendered very difficult. MORRICE, a writer on brewing, directs three pounds of cocculus indicus to be added to every ten quarters of malt. "It gives," he says, "an inebriating quality which passes for strength of liquor, and prevents second fermentation in bottled beer, and consequently the bursting of bottles in warm climates," — pleasant information this for those who indulge in these liquors; and satisfactorily accounting for the injurious operation of them on the human frame. According to WEPFER and ORFILA this substance in poisonous doses exhausts the irritability of the heart.

380. The *treatment* of poisoning by *cocculus indicus*, or by *picrotoxine*, consists in the prompt removal of the poison from the stomach, and in having recourse to the means advised for the effects of nux vomica (§ 377.).

381. v. CORIARIA MYRTIFOLIA possesses properties similar to the foregoing. It is frequently found as an adulteration of senna. According to Professor MAYER it produces violent fits of tetanus, followed by apoplectic coma. A grain injected into the jugular vein of a rabbit occasioned in about five hours a single convulsive paroxysm, which proved immediately fatal. SAUVAGES has recorded two cases of death caused by the berries. M. FEE has adduced five cases of poisoning, owing to the adulteration of senna with this substance; and one of them proved fatal. The symptoms were violent convulsions, locked-jaw, and colic. M. ROUX

also published, in an interesting memoir, three cases which came under his own observation, one of which proved fatal; the symptoms being sparkling and rolling of the eyes, locked-jaw, loss of voice, convulsions recurring in paroxysms of the duration of eight or ten minutes, and death after sixteen hours. Of those fatal cases the membranes of the brain on *dissection* were found congested in one, no other change being observed; the internal surface of the stomach and bowels was injected in another; and in the third no alteration could be detected. The *treatment* for poisoning with this substance does not differ from that recommended for the substances containing strychnia (§ 377.).

332. CLASS V. — IRRITATING AND DEPRESSING POISONS. — *Irritating and Paralysing — Acro-Sedatives.* — Although this class of poisons is more or less allied to the third and fourth classes, and not less so the sixth and eighth, still it is distinct from all of them — 1st. in the alterations of function and structures produced by it; and 2d. as respects the treatment required to remove these alterations. The substances ranged under this class not only affect the nerves of the part to which they are applied, but irritate them, and excite more or less of morbid action of the capillaries. In conjunction with this local action they are more or less imbibed by the membranes, and absorbed into the circulation, thereby affecting, each with modifying influence, the vital manifestations of the systems and organs of the body. Their general operation when administered in very large or poisonous doses is to irritate the tissues with which they come in contact, and to depress vital power throughout the frame, or to paralyse the functions of certain organs or parts. The irritating action they exert locally is extended, especially as respects some of them, to adjoining viscera; and this action is also exerted in those excreting organs which eliminate them from the blood, although often very slightly or inappreciably. But it is rare to observe after death evidence of irritation and its consequences to such an extent as to account for the fatal issue; and, therefore, we are induced to infer that, although these changes may have aided in producing this result, the depressing influence exerted upon the nervous systems, and upon the vitality of the frame in general, by this class of poisons, is that to which their fatal operation is mainly due. Even in those cases in which evidence of irritation, and the changes consequent upon this condition, are the most remarkable, although death may, according to the views of some, be ascribed chiefly or altogether to those changes, still they are insufficient of themselves to account for the rapidity of this issue, especially when they are compared with the extensive disorganizations observed after the more corrosive poisons, whose action is strictly local, and which often do not cause death until after prolonged periods of suffering.

383. i. ACONITE — *Monkshood — Aconitum napellus. — Aconita — Aconitine — Aconitina.* — According to the observations of Dr. Fleming, the species *napellus*, and its varieties, are the most poisonous of the genus. The amount of numbness and tingling felt on chewing the root, indicates the respective activity of the various species; the power of exciting these sensations, residing in the aconitina, which the plant contains. The most active officinal preparations are the tincture and alcoholic extract; but all parts of the plant are poisonous, this property residing in the *aconitine*, the alkaloid discovered in aconitum napellus by GEIGER and HESSE. Cases of poisoning by this plant are not frequent. I have seen only one instance; but injurious effects have followed, although rarely from a too large dose of the tincture. The expressed juice, and the officinal preparations, are most rapidly fatal when injected into a vein, or into a recent wound. They are also injurious in smaller quantity, and with greater rapidity when introduced into the serous cavities, or into the cellular tissue, than when taken into the stomach; and they are poisonous also when introduced into the mucous canals.

384. *A.* Applied *locally*, aconite produces very slight irritation of the tissues; but it often excites a sense of heat. It hardly occasions any visible change of the part. On the nerves it acts as a local sedative, especially to the nerves of sensation, occasioning numbness and tingling. The loss of sensibility is followed by impairment of muscular contractability, and irritability. It does not appear, according to Dr. FLEMING's experiments, to produce dilatation of the pupil; and he states that the topical application of the poison is unaccompanied by pain, redness, or swelling, even when the physiological and remote effects are produced to the greatest extent; the peculiar sensations caused by chewing the root being unattended by any inflammatory irritation.

385. *B.* The *remote* or constitutional operation of aconite depends upon the absorption of it; as shown, — 1st, by the rapidity and intensity of the remote action being in proportion to the absorbing powers of the part to which it is applied, and to the facility with which the preparation employed is capable of being absorbed; 2d. By the circumstance of no remote effects, or but slight effects, being produced when it is applied to the sound skin, although the topical action indicates that the nerves were affected by it, in the manner above stated. Being imbibed and absorbed into the circulation, it acts upon the nervous system, and more especially on the cerebro-spinal nervous system; impairing the sensibility and the functions of sense, and diminishing the power of muscular action. It seems also to impair organic nervous influence, and irritability, proving a sedative of the cardiac and vascular actions, and reducing, as shown by Dr. FLEMING, the strength, volume, and frequency of the pulse, more or less according to the dose. This antiphlogistic or sedative operation of aconite, has been fully evinced in various severe diseases for which I have prescribed it. It is of importance to determine whether or no the frequent or continued exhibition of this substance produces a *cumulative action.* Although I have often prescribed aconite, yet I have not had reason to believe that this action has ever occurred. Dr. FLEMING, however, states that two individuals were affected with general tremors, severe pain in the head and eye-balls, constant lachrymation, intense photophobia, heat of skin, quick pulse, and great restlessness, symptoms which were distinctly attributable to the continued use of this substance.

386. *C.* The *symptoms* produced by poisonous doses of the aconite are a sense of warmth in the stomach, with a numbness and tingling, and feeling of distension of the tongue and lips, sometimes

with slight nausea, followed by vomitings, or retchings. The countenance becomes pale and sunken, and muscular power prostrated. The senses are impaired, but consciousness remains, or slight wandering delirium appears. Some persons feel as if they were dying or sinking. The voice is whispering or lost: the respiration weak and superficial; the pulse weak, or slow, small or irregular. The surface is cold, and covered with a clammy sweat. At a more advanced period the patient becomes speechless, deaf, and blind. The pupils are at first contracted; but afterwards, sometimes general muscular tremors or slight convulsions supervene; the pulse at first slow, becomes imperceptible, the coldness of the surface and extremities increases, and the patient dies from syncope. In a case, in which I was consulted, petechial ecchymoses appeared on the surface of the body and on the face, and marked congestion of the brain occurred with hemiplegia, yet the patient recovered, the palsy having nearly disappeared when I saw him some years afterwards. In most cases, especially when any part of the plant has been ate by mistake, heat, sense of constriction, numbness and tingling in the mouth and throat are the first symptoms complained of. Vomiting or diarrhœa is generally present, with swelling of the abdomen. A lady was poisoned by eating the root in mistake for horse-radish with roast beef. She could not thus have taken much of it; but shortly afterwards slight vomiting with abdominal pains came on, and although emetics, &c., were used, she died in three hours.

387. The symptoms may appear immediately after taking the poison or not for one or two hours, the delay being owing to the part and state of the plant taken, and to the presence of food in the stomach. Five grains of the fresh extract of aconite were given to each of three patients in the hospital at Bourdeaux. In a quarter of an hour after taking the poison, they had tremors of the muscles, a pricking sensation over the body, and severe vomiting followed. They became unconscious; and on recovering their senses they complained of confusion of sight and intense headache. The pulse was slow and irregular, the respiration short and hurried; the skin was cold and clammy. Two of the patients recovered. Dr. Geoghegan adduces two cases, one of which died in an hour and a quarter after eating the root, and the other in two hours. One drachm of the root has proved fatal, but it is probable that less than this would kill an adult. Dr. Male died from the effects of not more than eighty drops of the tincture taken in ten doses, over a period of four days; the largest quantity taken at once having been ten drops.

388. *D.* The alkaloid, *aconitine*, is the most virulent poison known, exceeding even prussic acid. One fiftieth part of a grain of aconitina proved nearly fatal. Its operation and effects are altogether the same as those of aconite, only much more intense.

389. *E. Death* is produced by aconite owing to the sedative influence caused by it on the nervous system, or to its paralysing effect upon the muscles of respiration, or to the impaired irritability of the heart, fatal syncope supervening. The death of the human subject takes place generally by syncope, which sometimes occurs suddenly, unexpectedly and immediately: the fatal sedative and paralysing influence of the poison on the nervous system appearing chiefly in experiments on the lower animals, when the dose of the poison has been very large.

390. *F. The appearances on dissection* have been very imperfectly observed. Venous congestion, to a greater or less extent, has generally been found. In some instances, engorgement of the brain and membranes, with considerable subarachnoid effusion has been met with. In the cases recorded by Pallas, Degland, and Geoghegan, inflammatory appearances were present in the alimentary canal. The lungs were generally congested, and the blood very dark.

391. *G.* The more *diagnostic* or characteristic phenomena produced by this poison are numbness and tingling of the mouth and throat, or parts to which it is applied; vomiting or retching, with tumefaction of the abdomen, numbness, tinglings or tremors of the extremities, contraction of the pupils, slowness or failure of the pulse, and of the heart's action, and death from this last change.

392. *H. Treatment.*—If retchings only have occurred without free vomitings, an emetic, consisting of sulphate of zinc with capsicum, or of mustard mixed in water, should be administered. If the poison have passed into the intestines—or sufficient time have elapsed for this to have taken place, warm purgatives and enemata should be resorted to. Stimulants, as warm brandy and water; camphor or ammonia, with capsicum, and small doses of opium; sinapisms or terebinthinated embrocations over the epigastrium, or along the spine; strong coffee, and frictions of the surface, are the means chiefly to be confided in.

393. ii. Arsenic.—*Arsenious Acid—Arsenic and its compounds.*—Of all the varieties of death by poison none is more important, as Dr. Christison remarks, than poisoning by arsenic. The facility with which it as well as all other poisons may be procured in this country, and the ease with which it may be secretly administered, lead to its adoption for the purpose of murder. It is fortunate, therefore, that there are few substances, and hardly any other poison, which can be detected in such minute quantities, and with so great certainty, according to the full and minute directions which will be found in the works of Orfila, Paris, Beck, Christison, Devergie, Pereira, Taylor, Guy, and others. The *compounds* of arsenic met with and employed in the arts, and by which life may be destroyed either accidentally or intentionally, are, 1. The *protoxide* of *Berzelius*, or *fly-powder.*—2. *Arsenious Acid*, or *white arsenic.*—3. The *Arsenite of Copper*, or *mineral green.*—4. The *Arsenite of Potass*, or *Fowler's solution.*—5. The *Arseniate of Potass*; and 6. The various *sulphurets*, pure and impure, as *Realgar*, *Orpiment*, and *King's yellow.*—Of these, *arsenious acid*, or white arsenic, is that most frequently administered as a poison. Mr. Taylor states, that in 1837 and 1838 there were 185 cases of poisoning by this substance in England, the greater number of which were cases of suicide and murder.

394. White arsenic possesses a very feeble acid re-action, although it combines with alkalies. It has, in small quantity, hardly any taste, and hence the frequency and risk of its employment. It is sparingly soluble. Cold water dissolves from half to one grain to one fluid ounce of water; and boiling water allowed to cool upon the powder

dissolves a little more than one grain to the ounce of water. Mr. Taylor states that the presence of organic matter in a liquid diminishes the soluble power of the liquid. Viscid or mucilaginous fluids of course suspend the finer parts of the powder of this substance. The solubility and action of arsenious acid are said to be increased by admixture with nitre. This writer states, that a teaspoonful of powdered arsenic weighs about 150 grains, a table-spoonful 530 grains, and a pinch about seventeen grains.

395. *A. Symptoms.*—Arsenic, *taken into the stomach*, produces different *forms* of poisoning, according to the quantity and state of the poison, as respects admixture, &c., and to the state of the stomach and constitution of the individual—according to the various modifying circumstances already mentioned (§§ 51, *et seq.*). The *forms* of poisoning thus resulting are, 1st. *Acute*, 2d. *Chronic*; and the acute assumes two varieties, which have been distinguished and described by Dr. Christison.

396. *a.* The *acute form* of poisoning with this substance is differently characterised according as the arsenic affects more especially the alimentary canal, or the nervous system, and vital powers.—(*a.*) When the *digestive canal* is more particularly attacked, signs of violent irritation are manifested along its whole course, with faintness, sickness, burning pain, and tenderness in the region of the stomach. When the poison has been taken in a state of solution, these symptoms are felt very soon after its ingestion—generally from ten to fifteen minutes; but, in other circumstances, it usually does not begin to act until half an hour after it is swallowed; and its operation is seldom delayed beyond an hour. Several cases are, however, recorded in which the action of the poison was not manifested for several hours—for three, four, five, or even seven hours. Dr. Christison thinks that it is delayed for a longer or shorter time by sleep. The sickness and pain are soon followed by retchings and vomiting, especially when drink is taken. There are also heat, dryness, and tightness in the throat and pharynx, creating an incessant desire for drink, attending and occasionally preceding the vomitings. Sometimes this affection of the throat is very slight. When it is severe, it is often attended by fits of suffocation and convulsive vomiting; and by hoarseness and difficulty of talking. The matters vomited after alimentary matters have been thrown off are yellowish or greenish, and in the more protracted cases they are streaked or mixed with blood. Soon after the appearance of the gastric symptoms, diarrhœa generally supervenes; but in some instances, instead of diarrhœa, the patient is harassed by ineffectual calls, or tenesmus. About this time the pain at the pit of the stomach is excruciating, and is likened to a fire within him. It often extends over the abdomen, which becomes tense, tender, and sometimes swollen; but occasionally drawn inwards at the navel. If diarrhœa be considerable, or has continued for a short time, pain, heat, and excoriation of the anus are complained of. In some instances, the burning pain and irritation with vascular injection appears to extend from the mouth to the anus; and there are frequently also observed signs of irritation of the air-passages and lungs, with shortness of breath, tightness across the lower part of the chest, and occasionally darting pains. Sometimes symptoms of pneumonia are more fully developed. The urinary organs are often affected, the patient being distressed by frequent, painful, and difficult micturition, by pain in the bladder, or swelling of the penis. Females frequently experience burning pain, swelling or excoriation of the labia pudendæ. Occasionally the irritation is so great as to cause suppression of urine: but the disorder of the urinary organs rarely occurs unless the lower bowels are also severely irritated, and the case has been protracted for two or three days. Soon after the appearance of the first symptoms, the *pulse* becomes feeble, small, and rapid, and subsequently irregular, and hardly perceptible. The surface of the body and extremities are cold, and often covered with clammy cold sweats. The feet and hands often livid. The features are collapsed, and expressive of extreme suffering and anxiety. The conjunctiva is often very much injected; and the eyes are red and sparkling. The tongue and mouth are parched; and aphthous appearances are sometimes observed in the throat. Convulsive motions, especially of a slight form, and consisting of tremors or twitchings, often commence in the trunk and become more general. When the diarrhœa is severe, or has continued for a short time, cramps in the legs and arms are severe and frequent. Delirium sometimes appears towards the close, and is occasionally attended by stupor. Death takes place calmly, but is sometimes preceded by convulsions. In some instances, a remission of the symptoms has been observed, particularly when life has been prolonged till the close of the second or third day. In cases such as now described, constituting the most frequent variety of the acute form, death occurs about twenty-four hours after the ingestion of the poison, and generally before the close of the third day; but, in rare instances, life may be prolonged until the fifth or sixth day.

397. (*b.*) In the *second variety* of acute poisoning by arsenic, the signs of irritation and inflammation of the digestive canal are either slight or altogether absent; death ensuing in five, six, or seven hours, or at a period too early for the full development of inflammatory action, owing to the impression of the poison on the organic nervous system, and on the general vitality of the frame. When Sir B. Brodie injected a solution of the oxide into the stomach of a dog, the pulse was rendered slow and intermitting, and the animal became palsied in the hinder legs, lethargic, and died in convulsions. In some cases of this variety, one or two attacks of vomiting occur at the usual interval after taking the poison, but it seldom continues; extreme faintness, amounting almost to syncope, being the most uniform symptom. Pain is usually felt at the epigastrium, but it is sometimes very slight, and unattended by the other signs of inflammation. Occasionally there are oppression, stupor from depression, or slight convulsions; but the faintness and general sinking of the vital powers are the prominent phenomena; death commonly taking place in a few hours. Even in the more protracted cases, and where life continues till the second day, extreme vital depression is the most striking feature. Dr. Christison remarks that this acute variety has been observed,—1st, when the dose of the poison was very large; 2d, when it was in small masses; and, 3d, when it was in

a state of solution. The first and last of these circumstances account for the rapidity and character of the symptoms, as furnishing the conditions favourable to a general or extended impression of the substance on the villous coat of the stomach, and a rapid absorption of it into the circulation: but the second circumstance just named admits not of so ready an explanation. Cases of this variety of poisoning by arsenic are not frequent; but Dr. CHRISTISON has referred to twelve instances in illustration of it; and which sufficiently show that the most rapid cases of poisoning by arsenic are not always attended by either violent or well-marked symptoms. It should, however, be recollected that the present variety passes insensibly into the former—that many cases will present phenomena approaching more or less either of the varieties now described, or intermediate between them.

398. All the above symptoms are not present in every case of the acute form, for pain may be entirely absent, although the quantity of the poison has been very great; the greatness of the quantity, as just stated, having been supposed to have been the cause of its absence. But Mr. TAYLOR states, that a case occurred in Guy's Hospital, where only forty grains had been taken, and the patient died without complaining of pain. The symptoms of intestinal irritation are seldom wanting, or there is vomiting if there be no purging. But Mr. TAYLOR refers to a case in which there was neither vomiting nor purging. Thirst, although a most common symptom, may also be absent.

399. *b.* The *chronic form* of poisoning by arsenic may also present *two varieties* or states. — (*a.*) In *one* the symptoms may at first be acute and inflammatory; but these may subside, with or without treatment, and signs of nervous irritation and vital depression become most prominent: or the inflammatory and the nervous symptoms may appear together, and proceed *pari passu*. The nervous affection varies in different persons. It chiefly consists of partial or incomplete palsy in some cases, or of more or less complete epilepsy in others, or of partial or irregular convulsion; or they may even resemble those of hysteria, of tetanus, or of delirium, passing into stupor. Five individuals partook of a dish poisoned with arsenic, and were seized with the usual symptoms of inflammatory irritation of the alimentary canal. One of these had an epileptic fit on the first day, which returned on the second, with frequent twitches of the muscles of the trunk, numbness in one side, and heat and tingling of the feet and hands. Another had tremors of the right arm and leg, followed by epileptic fits in the night, which returned the next fifteen days at the same hour in the evening, and afterwards recurred at intervals for several months.

400. Of the *secondary* effects of this variety of arsenical poisoning, *palsy* and spasm or *contractions* of the extremities are the most frequent. The palsy is generally partial, and often commences at the fingers or toes, and proceeds gradually upwards. Dr. MURRAY (*Edin. Med. and Surg. Journ.*, vol. xviii. p. 167.) has given an instructive account of this effect of arsenic. Four persons were affected about an hour after breakfast with the primary symptoms of poisoning by arsenic. But, in addition to these, the muscular debility was extreme; and in two amounted to true partial palsy. One of them lost altogether the power of the left arm. The other had great general debility and long-continued numbness and pains of the leg. In a case of an over-dose of the arseniate of potass, the paralytic affection consisted in the loss of sensation and of motion of the hands, and the loss of motion in the feet, with contraction of the knee-joints.

401. (*b.*) In some instances, especially *when the dose of the poison has been small and frequently repeated*, instead of the acute or inflammatory symptoms at the commencement, indications of *slow* or *chronic poisoning* approach insidiously, and may be mistaken for chronic disease of the digestive organs or of the nervous system. HAHNEMANN has briefly defined *slow poisoning* by arsenic as "a gradual sinking of the powers of life, without any violent symptom—a nameless feeling of illness, failure of strength, an aversion to food and drink, and all the other enjoyments of life." This is, however, not a correct view of such cases, although it may represent a few of the most slow or chronic states produced by this poison; as with the gradual sinking of vital and of muscular power, there are generally more or less of the symptoms about to be enumerated also present:—Protracted indigestion with flatulence, pain in the stomach or bowels, sometimes in the course of the colon; slight diarrhœa, or tenesmus, or both; furred tongue, with dryness, constriction of the throat, and thirst; severe attacks of flatulence, sometimes with hiccup when substances are taken into the stomach; occasionally salivation or exfoliation of the epithelium of the lips, cheeks, and throat; inflammation of the conjunctiva, with suffusion of the eyes, intolerance of light, and frequently with a dark circle surrounding the eyes; irritation of the skin, often with an eruption—the *Eczema arsenicale*—and exfoliation of the cuticle, and falling out of the hair; extreme muscular weakness, tremors, paralysis, spasms, or contractions of the limbs; sometimes convulsions, anxiety, faintness or syncope; shortness of breathing, dry cough; palpitations on slight exertion, or upon being startled, remarkable weakness, smallness, and irregularity of the pulse; emaciation, swelling or œdema of the extremities; nervous headache, mental depression, sometimes low delirium, stupor, or even death, have supervened upon excessive or too long continued doses of arsenical preparations. I once suffered severely from dyspepsia and excessive flatulence caused by an accidental over-dose of FOWLER's solution; and I have met with several cases where the above symptoms—some in one case, others in another, &c.—have followed the use of these preparations. There is also some reason to believe that endocarditis and lesions of the valves of the heart have been excited by the too liberal employment of the arsenical solution. I have at present a patient with disease of the cardiac valves, who has taken the solution in very large doses, and during several protracted courses, for lepra.

402. *B. The application of arsenic to sores, ulcers, or eruptions; or to wounds, or to blistered or other surfaces deprived of its cuticle*, often has produced fatal poisoning. When arsenic is thus applied, both local inflammation is excited or increased, and constitutional effects are produced by its absorption. WEPFER states that a girl, affected

with psoriasis of the scalp, had it rubbed with a liniment of butter and arsenic; and was soon seized with acute pain and swelling of the whole head, fainting fits, restlessness, fever, delirium, &c. She died in six days. Similar cases are recorded by Amatus Lusitanus, Zitmann, Belloc, Roux, Blackadder, and others; the arsenic having been applied to sores or ulcers. Harles remarks, respecting the propriety of the outward application of this substance, that it may be applied with safety to abraded surfaces, to common ulcers, or to malignant sores, even when highly irritable, provided the part be not recently wounded, so as to pour out blood. This distinction is not, however, to be confided in, under every circumstance; for the poison may be absorbed without being imbibed by the venous capillaries of the part.

403. When arsenic is thus applied, inflammation of the part, extending more or less, is generally produced. In some instances the local irritation is but slight, or altogether absent: but it is in others very severe. The lesions, consequent upon the absorption of the poison when thus employed, are irritation of the stomach and bowels, especially of the rectum; various affections of the nervous system, as spasms, convulsions, palsy, &c.; faintness, and vital depression. In several instances palsy has appeared in parts adjoining that to which the poison was applied. An arsenical preparation was long employed to destroy a tumour on the right side of the neck, and was followed by complete palsy of the muscles of the neck and arm of that side.

404. *C. The poison may be administered in enemata.* — Fodéré adduces the following case. A lady was under treatment for some slight disorder; but died unexpectedly after symptoms of poisoning. It was afterwards discovered that her servant, after unsuccessful attempts to poison her by dissolving arsenic in her soup, had succeeded by administering it in injections. In this way, doubtless, all the effects of arsenic may be produced, and the poison be the less likely to be detected after death — this mode of poisoning requiring all the vigilance which the physician can exert.

405. *D. This poison may be introduced into the vagina.*—Amongst other instances of this mode of poisoning adduced by Ansiaulx and Christison, the following is recorded by Dr. Mangor. A farmer near Copenhagen lost his wife under suspicious circumstances, and six weeks afterwards married his maid-servant. In a few years he attempted, aided by another servant, to poison his second wife. Having failed, he introduced a mixture of arsenic and flour into the vagina after coition, in the morning. The symptoms appeared about mid-day, and death took place next morning. The murderer married, soon after, his guilty paramour, and after a few years got rid of her in a similar manner. About three in the afternoon she was seized with shivering, and with heat and pain in the vagina; the poison having been introduced in the morning. The remembrance of her former crime excited her suspicions, and she wrung from her husband a confession. On the local symptoms, acute pain in the stomach, incessant vomiting, and delirium supervened: death took place after twenty-one hours. On *dissection*, grains of arsenic were found in the vagina, although frequent lotions had been used in the treatment. The labia were swollen and red, the vagina flaccid, the os uteri gangrenous; the duodenum was inflamed, the stomach natural.

406. *E. Poisoning by arsenic may take place through the respiratory organs.* — This usually occurs in consequence of the *accidental inhalation of arsenical vapours.* Otto Tachenius, a chemist of the sixteenth century, quoted by Dr. Christison, states, that he once incautiously happened to breathe the fumes of arsenic, and was surprised to find his palate impressed with a sweet, mild, grateful taste, such as he never experienced before. But in half an hour he was attacked by pain and constriction of the stomach; then with difficult breathing, general convulsions, an unspeakable sense of heat, bloody and painful micturition, and, finally, with such an acute colic as contracted his whole body for half an hour. He recovered from these alarming symptoms by taking oleaginous drinks; but during all the succeeding winter he had low hectic fever. There can be no doubt of arsenical vapour or fumes being rapidly poisonous, when inhaled in a concentrated state, or even when very diluted, if longer breathed; and then they may produce slow or chronic poisoning. The vapour may even be employed in this way with criminal intentions. Dr. Christison has quoted several writers and cases illustrative of this mode of poisoning. The following is a most instructive instance of the kind: — An apothecary inhaled the fumes while subliming arsenic; and was soon after seized with frequent faintness, constriction at the præcordia, difficult breathing, constant thirst, parched tongue and throat, great restlessness, watchings, and pains in the feet. He had afterwards profuse daily perspirations, and palsy of the legs; and several months elapsed before he quite recovered. (See B. Timæus, Cas. Med. L. vii. c. 11.; and Christison, Op. cit., p. 302., for similar cases.) Paracelsus, being one day enraged with an acquaintance, held him over an alembic in which arsenic was subliming; but the object of his temper nearly lost his life.

407. *F. Applied to the sound skin*, arsenic has either no effect, or merely a slow and slight effect, unless under certain circumstances. If the poison be simply placed in contact with the skin it seldom acts; but if it be rubbed upon the skin, especially when mixed with fatty matters, it acts chiefly locally, producing a pustular eruption or eschars; but according to Renault it produces no constitutional disorder. This statement, however, should not be depended upon; for there are several facts recorded that prove arsenic sometimes to have been productive of very serious local and constitutional effects when applied to the human skin, either in the state of fine powder, or in the form of ointment, liniment, or paste. In these cases, several of which are adduced by Dr. Christison, the symptoms were faintings, giddiness, pain in the stomach, vomitings, tenesmus, ardor urinæ, tremblings of the limbs, low delirium, hectic fever, debility, prolonged recovery, and falling out of the hair.

408. *G. Diagnosis.* — Poisoning by arsenic may be mistaken for the severer states of *cholera*, or even for a case of *pestilential cholera*. The propriety of deciding the question, from the symptoms alone, as to whether or no poisoning has been produced

by arsenic, belongs more especially to the writer on Medical Jurisprudence. This question has been ably discussed by Dr. CHRISTISON and the other writers so often referred to. But the diagnosis between poisoning by this substance and natural disease falls more especially within my province. It should be admitted that the diagnosis is often difficult; but due attention to the history of the case, especially in respect of the accession of the attack; the prickings, burning sensations, or heat, redness and constriction in the throat, and in the course of the œsophagus, especially early in the attack; the redness of the eyes; the swelling, heat, pain, and excoriation of the anus; the tenesmus, and the burning or colicky character of the abdominal pain; the ardor urinæ, dysuria, and heat of the urinary passages; the increased suffering on speaking and swallowing; the consecutive eruption of pimples, or excoriations of the lips, tongue, and throat; the nature of the nervous symptoms, particularly the epileptic form of convulsions, the incomplete or partial palsy, the nervous sinking, anxiety, and muscular tremors, and the low delirium, are diagnostic of poisoning, especially by this substance, and are rarely present, even individually, in cholera, and perhaps never in such states of association as are observed after the administration of arsenic. But strict attention to the phenomena and recollection of the symptoms as described above will show the nature of the case with tolerable certainty; although much more precise information, as respects both the moral circumstances and the chemical investigation, will be required for the administration of justice.

409. *H. The organic lesions produced by the preparations of arsenic.* — These have been described most ably by Dr. CHRISTISON, and illustrated by reference to numerous cases, to which I must refer the reader. The changes produced by arsenic are numerous, and varied in most instances, according to the quantity administered, the state of the stomach at the time, and the period the patient lived after its ingestion. Similar changes are usually observed after poisoning by the external application of the substance to those produced by its internal administration. The most remarkable alterations are generally found when the quantity swallowed has not been very large, and when the individual has lived sufficiently long to admit of the development of inflammatory action and its more immediate consequences. When death has taken place very rapidly—in a shorter period than eight or ten or even twelve hours, little or no change is often observed. In these cases, it may be presumed that the impression of the poison on the organic nervous system, and the action consequent upon its absorption on the heart and nervous centres, cause death before vascular reaction could supervene. — *a.* Much more frequently, however, the internal surfaces of the stomach and duodenum, often also of the œsophagus and pharynx, on the one hand, and of the intestines, more especially the rectum and colon, on the other, evince signs of inflammatory irritation and certain of its more immediate results, especially capillary injection, sometimes with small ecchymosis, or slight extravasations of blood, or softening of the villous coat, or effusion of lymph, or ulcerations. Redness with vascular injection is seldom absent from the throat and gullet, when the patient has lived above a few hours. In the stomach, the colour is often a dull or brownish red; or it is of a brighter hue, interspersed with dark striæ of altered blood. The ecchymoses and larger extravasation of blood are always of a dark hue. Ulceration rarely occurs, and chiefly in cases where death has not taken place until after the second or third day. Although inflammatory appearances may be absent in cases which have ended rapidly, yet they have been found in the stomach in several which have terminated in five, six, seven, or eight hours after the administration of the poison. Thickening, or tumefaction of the villous membrane, with more or less softening, a friable state of it, and even abrasions of minute portions, are occasionally observed. Gangrene and perforations of the stomach or intestines are never found. Changes, which have been mistaken for gangrene, have consisted chiefly of extravasations of dark blood. The ulcerations said to have been found in some instances when death has taken place a few hours after the ingestion of the poison, are very probably minute abrasions or excoriations of the villous surface. A sanguinolent fluid is sometimes found in the cavity of the stomach; and occasionally arsenic, variously altered in its appearance, is found closely adhering to the internal membrane. The colon is often much contracted and its inner surface inflamed, especially the sigmoid flexure and the cæcum. The rectum is generally much inflamed and excoriated, the latter change extending around the anus, particularly when life has continued one, two, or three days.

410. *b.* The *respiratory organs* sometimes are found congested, and the bronchial membrane more or less reddened. Occasionally the pleura is injected, and slight effusions of serum exist in the pleural cavities. The *heart* is generally flabby, and sometimes the inner surface, particularly the columnæ carneæ and valves, is more or less reddened. The *blood* is often fluid and generally dark-coloured. Slight effusions of serum and congestion are occasionally found within the *cranium*. Inflammatory changes are frequently seen in the *urinary passages*, and often extending to the female sexual organs.

411. *c.* The *antiseptic influence* of arsenic, more especially upon those parts where this substance exerts its injurious action, or where it is brought in contact, has recently attracted attention and been fully established. It thus very frequently not only preserves these parts, more especially the alimentary canal, from putrefaction, but also the alterations which it had produced in them. It may be presumed that the amount of antiseptic effect will depend very much upon the quantity of the poison, and upon the retention of it in the body at the time of death. If much of it remain in the stomach and bowels, or become absorbed and continue either in the blood or in the several tissues and organs, an antiseptic and mummifying effect may be expected; but if the poison be discharged by vomiting and purging, and eliminated from the body before death takes place, then the putrefaction process will proceed as usual, or even with greater celerity. This effect of arsenic, in arresting the progress of putrefaction, seems to be the result of a chemical action exerted by this substance upon the fluids and soft solids of the body.

412. *I. The quantity of arsenic likely to destroy life* depends upon a variety of circumstances. But

four grains, or even *three*, may kill a child, if it be taken in solution or when the stomach is empty. Dr. CHRISTISON adduces the case of a child who died in six hours after taking four grains and a half in a state of solution; and a woman, seventy years of age, was killed by four grains. Mr. TAYLOR states that a young lady died after eating a portion of cake which could not have contained more than *four* grains, and probably less than three grains. He states, that three of a party at dinner who had partaken of the port wine on the table were seized with symptoms of arsenical poisoning. The wine was found to contain about one to two grains of the poison in each fluid ounce. A lady took a quantity containing less than two grains of arsenic. In about half an hour she experienced faintness, violent vomiting, but no pain. She recovered after a few hours. A gentleman took as much as contained little more than two grains. His symptoms were similar, but more severe. If he had taken another glass of the wine, he might have been killed. Although the wine was saturated with arsenic, yet no peculiar taste was perceived. The escape of these persons was probably owing to the circumstances of the wine having been taken on a full stomach, and of its having been soon followed by violent vomiting. It is probable that, from one to two grains would prove fatal to a child or to a debilitated person, and three grains to an adult. On the other hand, cases of recovery from the ingestion of large quantities are not infrequent. A person recovered after taking half an ounce, the poison having been carried off by vomiting and purging; but instances of recovery from so large a quantity are very rare, and are owing to the arsenic having been taken on a full stomach, and to its speedy evacuation.

413. *K. The period at which death takes place from arsenic* varies with the circumstances so often alluded to. Dr. BORLAND informed Mr. TAYLOR of a case in which two ounces of arsenic were taken, and death took place in less than *two hours* from syncope. There was neither pain, vomiting, nor diarrhœa. Such rapidly fatal cases are very rare. But the time at which death takes place is not strictly dependent upon the quantity of the poison taken. There are many cases reported in which death has occurred in from three to seven hours, but much more frequently it does not supervene until a period varying from twelve or eighteen hours to three days, in the acute forms of poisoning by this substance. In thirteen cases recorded by Dr. BECK, the smallest quantity taken having been one drachm, and the largest two drachms, the shortest period for death was four hours, the longest two days. In one instance, two ounces of the poison destroyed life in three hours and a half; but in another case four or five grains killed a person in four hours; so little does the rapidity of the effect depend upon the dose or quantity. When the poison has been administered in small and repeated doses, and in cases of *slow* or *chronic* poisoning, and in some instances of the external application of it, and when a partial recovery from the first effects has occurred, a fatal issue may not take place until many days or weeks after its administration.

414. *L. The modus operandi of arsenic* has not always been rightly estimated. This substance has been generally considered as a tonic; but, judging from my experience of its action in my own person, and in the treatment of many diseases, I cannot believe that it possesses any tonic properties, but, on the contrary, that it exerts an *irritating* and *depressing influence*; its chief *medicinal effects* being *anti-periodic* and *alterative*,—effects which result from the employment of it in very small and frequently repeated doses; an irritating and depressing, or paralysing action, following the administration of larger doses. Its local operation is chiefly as an irritant, capillary injection, inflammation, and its immediate consequences usually occurring. But the primary impression produced by large quantities of this poison is probably sedative as respects the nervous system, both locally and generally, inasmuch as death, preceded by signs of vital depression, often takes place before inflammatory appearances are developed. That *arsenic is absorbed* into the circulation, and affects this fluid, the heart, and the nervous centres, are facts, which the detection of it in the liver, spleen, kidneys, lungs and urine, fully proves, and which the changes in these organs further serve to show. Even when it is applied to an abraded surface, or to parts which admit of its absorption, it has been found to affect more especially the inner surface of the stomach, duodenum and large bowels, and it has been detected in these situations by chemical research. It appears to exert a specific influence upon the alimentary canal, irritating and inflaming it, and at the same time depressing the organic nervous energy. It exerts also a marked action on the emunctories by which it is carried out of the circulation, especially the urinary organs, the villous surface and glandular apparatus of the large bowels, the skin and lungs; exciting, irritating, or inflaming these, according to the quantity existing in the circulating fluids.

415. *M. Treatment.*—As the poisonous operation of the preparations of arsenic is chiefly owing to the absorption of them, it is obvious that, before they can be absorbed, they must be dissolved—either dissolved when administered, or subsequently by the juices of the stomach. Therefore no substance ought to be recommended as an *antidote* unless it possesses the property of rendering the arsenic insoluble, or of preventing its solubility; and no known compound possesses this power to any considerable extent. The *hydrated sesquioxide of iron* possesses this property to a certain extent. Mr. TAYLOR performed many experiments on this antidote, and obtained the following results:—1st. When arsenious acid is *dissolved* in water, and agitated with twelve or fifteen times its weight of the hydrated oxide, the poison is precipitated with it in a very insoluble form. 2d. When the poison is mixed and agitated in a state of *powder* with the oxide, there is little or no effect; the poison being only mechanically diffused through the oxide. 3d. When the poison in powder is mixed with oxide of iron rendered alkaline by ammonia, so much appears to combine with the iron as the quantity of alkali present will render soluble in cold water. The rest is diffused in granules through the oxide. Most of the experiments, he adds, in favour of this antidote have been performed in solutions of arsenic; and therefore the results are irrelevant, since arsenic is most frequently taken in powder, and often in very coarse powder. Recently the *acetate of the sesquioxide of iron* has been recommended as an antidote by M. DUFLOS; but Mr. TAYLOR found that, in respect of arsenic

in *powder* it is as inefficacious as the hydrated oxide, even when an alkali is added, to produce effectual precipitation; and that, with regard to the solution, the poison is more readily precipitated by the hydrated oxide than by the acetate of iron. Other antidotes have been mentioned, more especially large doses of *magnesia* and *charcoal;* but they deserve little credit, and are no further serviceable than by involving the poison more or less, and thereby preventing its action upon, or its absorption by, the surface of the stomach — an intention which may be accomplished more completely by albumen, milk, and various other substances. The substances formerly lauded as antidotes, have been shown by the researches of RENAULT, ORFILA, and others, to be quite inefficacious; whatever of success may have followed their exhibition having been owing to the several circumstances shown above (§§ 51. *et. seq.*), to modify, counteract, or prevent the operation of poisons.

416. So little advantage, therefore, being likely to be derived from antidotes, our chief hopes should be placed on the immediate evacuation of the poison from the stomach, and upon the removal of the injurious effects which may have been produced. If *vomiting* has not taken place, or is insufficient, it should be promoted by an emetic of sulphate of zinc, or sulphate of copper, or by mustard taken at intervals in a wine-glass of water, or by tickling the throat with a feather; or the contents of the stomach may be removed by the stomach-pump, avoiding as much as possible the introduction of fluids when the poison has been taken in a state of powder or of imperfect solution. When vomiting takes place it may be promoted by taking albumen, milk, thick mucilaginous fluids, linseed tea, &c.: and, although the patient should not be allowed to exhaust his strength in retching, without some one of these fluids being taken for the stomach to act upon, still it should not be taken in too large a quantity at one time, in order that the stomach may contract frequently on itself, and thus expel from its surface the mucous secretion which often envelopes the poison, and protects the inner surface of the organ from its action. Mr. TAYLOR advises a saponacious liquid, made of equal parts of oil and lime-water, to be given; and Dr. PARIS a free exhibition of olive oil. When vomiting has commenced from the action of the poison, an emetic or the stomach-pump is then necessary, as this operation will proceed, when aided by the fluids just mentioned.

417. Having by these means discharged the poison from the stomach, there generally remain two formidable morbid conditions produced by it to be removed. These are inflammatory irritation and action of the alimentary canal, and nervous or vital depression, with various concomitant phenomena. This association is of the most perplexing kind, inasmuch as the means calculated to relieve the one aggravates the other. Nevertheless, if there is sufficient reason to infer that the poison is altogether evacuated, and more especially if the first impression or shock produced by the poison has passed off, the pain and vomiting having developed more or less reaction, bloodletting, general or local, or both, will be practised with advantage; but if too early resorted to, the absorption of the poison and the vital shock may be both increased by it. Terebinthinated epithems, sinapisms, or blisters over the epigastric region, or over the greater part of the abdomen, and a free exhibition of opium by the mouth, and in starch or mucilaginous enemata, are generally most beneficial; but before opium be given, the entire evacuation of the poison should be ensured. Subsequently, and when the irritation of the bowels assumes a dysenteric character, or when tenesmus, or dysuria is urgent, the opium may be conjoined with ipecacuanha, camphor, nitrate of potass, tragacanth, &c.; and these may be administered also in enemata. The medicated warm-bath; fomentations to the perinæum and anus, preceded by the application of leeches to those parts, and a farinacious, or mucilaginous diet are important parts of the treatment.

418. The *nervous symptoms* often accompanying the vital depression produced by the poison, are most successfully treated by opium taken with small doses of camphor; by the application of terebinthinated embrocations, and by mild tonics and restoratives in small doses, and in demulcent vehicles. If palsy continue after the removal of disorder of the digestive organs, exercise in the open air, the preparations of nux vomica, or strychnia cautiously prescribed, and external irritants are the chief means of cure. If the bowels become confined, either during the more chronic cases, or during recovery or convalescence, olive oil, taken in frequently repeated doses, and administered in enemata, is the most appropriate aperient During convalescence, and for a long period afterwards, dyspepsia, flatulence and various states of disorder of the digestive organs often continue for a long time, and are best relieved by change of air, by travelling, and by strict attention to diet, — by the adoption of a bland, farinaceous diet, avoiding spirituous liquors, and the substances pointed out as injurious in the article on INDIGESTION.

419. iii. COLCHICUM AUTUMNALE — *Meadow saffron.*—All the parts of this plant are poisonous at such periods of the year as occasion their development or perfection, but they vary slightly in their effects. The several preparations of the plant have lately been much employed in medicine, on account of their influence in paralysing or diminishing morbid sensibility, in removing pain, and in increasing the functions of excreting organs, especially of the digestive canal, the liver and kidneys; its effects on these, however, being by no means certain. In large doses, it acts as an irritant of the alimentary canal; and as a sedative, often remarkably depressing vascular action, and vital power. Even from small or medicinal doses, these injurious effects are manifested in some instances, and not in a few of these the vital depression is extreme, and consequent upon one-third or one-fourth of the usually prescribed medicinal dose. I have seen on several occasions poisonous effects produced by too great temerity in the use of this medicine; and these effects were not manifested so injuriously on the digestive canal as on the nervous system and vital influence; extreme sinkings, failings of the pulse, and syncope, following its ingestion. In two instances, — in one a powerful man, — a single dose of only ten minims of the tincture, which I prescribed for gout, produced alarming symptoms; and a drachm taken by a medical man contrary to my advice, produced effects from which he recovered with diffi-

culty. In some constitutions, owing to idiosyncrasy, it acts with remarkable severity, particularly as respects the vital depression produced by it. GEIGER and HESSE discovered a principle in this plant, or alkaloid, which has been called *colchicina*, *colchicia*, or *colchicine*, and which neutralizes acids, and forms with them crystallisable salts.

420. *A.* The *symptoms* arising from poisonous doses of colchicum have been described by Messrs. FERRIDAY, CHEVALLIER, DILLON, HADEN, and CHRISTISON. The *cormi*, the *seeds*, the *flowers*, and the *leaves* of the plant, produce nearly similar symptoms when taken in large quantities. An hour, or an hour and a half, after the ingestion of the poison, acute pain, followed by retchings, vomiting, and tenesmus or purging, or both, is experienced. The pulse soon becomes feeble, the countenance anxious, and afterwards the matters vomited are dark-coloured, and the purging profuse and watery. The pulse is excessively slow or feeble, the respiration hardly perceptible or feeble, the muscular weakness extreme, and the urine suppressed, the watery portions of the blood being discharged by the bowels and stomach. The patient sinks after a period varying, with the dose and the constitutional powers, from a few hours to three or four days; but there are neither convulsions, nor insensibility, nor delirium, unless in a few instances. Mr. TAYLOR states that a burning pain is felt in the throat and œsophagus; but this is not mentioned in the details of some cases, and probably it depends much upon the state in which the poison is taken. Mr. MANN communicated to him a case, in which three drachms and a half of the wine of colchicum were taken in divided doses, and caused death on the fourth day. There was no inflammation of the mucous membrane found on *dissection*, but simply extravasation of blood into the mucous follicles. Mr. TAYLOR states, that a man took a decoction made with a tablespoonful of the seeds and a pint and a half of water. He was seized with vomiting and purging, which were incessant until death, which took place in about thirty-six hours. The only appearance of note was, that the stomach had a violet or purple hue. A gentleman swallowed, by mistake, an ounce and a half of the wine of colchicum: he was immediately seized with severe pain and the other symptoms, and died in seven hours. In another instance, where an ounce was taken, death occurred in thirty-nine hours. Most of the cases recorded of poisoning by this substance have been detailed imperfectly and loosely. In Mr. FERRIDAY's case, which has been given more fully than the others, there was no cerebral disturbance.

421. *B.* The chief appearances observed on *dissection*, were a patch of redness in the internal surface of the stomach, near the cardiac orifice, and a slight effusion of blood between the muscular and peritoneal coat of a portion of the jejunum. The omentum was turned up between the stomach and convex surface of the liver behind, and the diaphragm in front. The pleuræ were somewhat reddened, and the lungs much congested with black blood. The heart was flabby, and its structure easily broken down. The surfaces of the lungs, diaphragm, and heart were covered with ecchymosed spots. The bladder was empty. The face, neck, front of the thorax, insides of the thighs, and the integuments of the scrotum and penis, were covered with patches of purple efflorescence. (*Lond. Med. Gaz.* vol. x. p. 160.) In the bodies of the children mentioned by BERNT there was considerable redness of the stomach and small intestines. In GEIGER's case, inflammatory appearances were seen in the stomach and small intestines. In a case related by M. CHEVALLIER, and in another adduced in the *Edinburgh Medical Journal*, no alterations were found. (CHRISTISON, *op. cit.* p. 792.)

422. *C. Treatment.*—Retchings often continue for some time, and are ineffectual; therefore full vomiting should not be expected, without the aid of an emetic, which may consist of sulphate of zinc or mustard mixed in water. The stomach-pump may be employed if the patient be seen soon after the ingestion of the poison. After the evacuation of it from the stomach, it remains to counteract the injurious impression produced by it on the organic nervous system, and upon the heart and nervous centres by its absorption into the circulation; and the only means we can employ with these intentions with any hopes of success, are opium, ammonia, camphor, capsicum, and creasote, variously combined, according to circumstances. I have had very frequent recourse to the preparations of colchicum in practice, but have seldom given them in full doses, without conjoining them with one or more of these substances, which have always prevented any unpleasant symptoms from following their administration. Where idiosyncrasy also has stood in the way of their exhibition, I found these medicines prevent any sinking and distress, and to remove these effects when they have appeared. There can be no doubt, therefore, that these remedies are most appropriate in cases of poisoning by colchicum. They may be aided by sinapisms, or terebinthinate embrocations, or epithems over the abdomen, and by mucilaginous or oleaginous draughts and injections, which may be made the vehicles of the remedies just advised.

423. iv. HELLEBORE.—*Black hellebore, Helleborus niger,—White hellebore, Veratrum album — Veratrum sabadilla—Veratrine—veratria.*—The operation of black hellebore and of veratrum is nearly similar; and the alkaloid of the latter—*veratria*—produces the same action as either of these, a much smaller quantity being required to produce the same amount of effect.—*A. Black hellebore*, in poisonous doses, causes a burning pain in the stomach and intestines, vomitings, purging, cramps in the lower extremities, cold sweats, faintness, paralysis, sometimes insensibility from exhaustion or vital depression, and extreme weakness of the pulse. Death appears to result from the excessive vomitings and purging, and impaired irritability and action of the heart.

424. *B. White hellebore—Veratrum album*—acts as a local irritant, exciting at the same time the nerves of the part. In excessive doses, it irritates the digestive mucous surface, and depresses nervous and vital power. The *symptoms* are violent vomiting and purging, sometimes of blood; tenesmus, and griping pains in the bowels. These are preceded or attended by a burning sensation in the mouth, throat, and œsophagus; constriction of the throat, with a sense of strangulation; and are soon followed by a small or almost imperceptible pulse; by faintness, cold sweats, tremblings, giddiness, loss of voice, blindness, and dilated

pupils, insensibility, syncope or convulsions terminating life. In some cases, noticed by Dr. PEREIRA as having occurred to Dr. RAYNER, these symptoms were present, with the exception of purging.

425. *C. Veratria* is poisonous in very small doses. Mr. TAYLOR states that a physician prescribed for a lady one grain of veratria divided into fifty pills, and three were directed to be taken for a dose. Not long after the first dose had been swallowed she was found insensible, the surface cold, the pulse failing, and with other symptoms of approaching dissolution. She remained some hours in a doubtful state, but ultimately recovered. If the veratria was well mixed in the pills, the dose was here not large; but this admits of doubt.

426. *D.* The *treatment* of poisoning by these substances is similar to that recommended for other poisons belonging to this class. After the evacuation of the poison, the effects should be attempted to be removed by means of stimulants conjoined with opium. In a case treated by Dr. PEREIRA, the infusion of nutgalls seemed to give relief. Coffee has been recommended both as a drink and as a clyster. The external applications already advised in similar circumstances should not be withheld. Demulcents should be made the vehicles for stimulants, astringents, and opiates.

427. v. FOOD-POISONS—*Poisonous food—Poisonous fish — Poisonous meats — Poisonous cheese.* — Various articles of food not infrequently occasion injurious effects, and even death in a few hours. The slighter effects have sometimes arisen from idiosyncrasy; but not so frequently as supposed by some writers. This cause may be admitted in respect of those instances which have sometimes occurred of a single person only having been affected, of several who have partaken of the same article or dish. Poisonous articles of food — fish, meats, &c., have hitherto been classed as *acronarcotics.* As they are more or less *irritant*, and as acrid and irritant convey ideas nearly related, the first part of the appellation somewhat approaches the truth; but that they produce narcotic or stupifying effects cannot be so readily conceded, inasmuch as this particular effect no further appears than as it results in some instances from the sinking of vital and cerebral power, and the diminution of sensibility owing to this state. These poisons in truth act as irritants of the alimentary canal, and as sedatives or depressants, or paralysers of organic nervous or vital energy. Whilst they irritate the mucous surfaces, and glandular apparatus of that surface, they rapidly depress vital power; and the irritation they occasion passes not into inflammatory action, but into excessive secretion and exhalation, — or, if inflammatory action be developed, it is of an asthenic and spreading form. That these poisons do not act locally only may be inferred from the ultimate effects being much more serious in most instances than the amount of local lesion can explain; from their contaminating nature, from the ready imbibition of them by mucous surfaces, and from their speedy absorption from these surfaces. The various articles which are sometimes productive of poisonous effects occasion modified or even different symptoms; but they are remedied by very nearly the same means.

428. *A.* POISONOUS FISH. — Several species of fish, both in this climate and between the tropics, are always poisonous; and others are injurious only occasionally or rarely. Some accounts of the poisonous fishes of the tropics have been given by Drs. THOMAS, CHISHOLM and FERGUSSON; and various memoirs and notices of poisonous fish in this country and Europe have been published by Dr. BURROWS, Dr. COMBE, Dr. EDWARDS, Professor ORFILA, and Professor CHRISTISON. I had occasion many years ago within the tropics to treat a case of poisoning by fish, which nearly proved fatal; and I have seen two or three instances of poisoning by mussels in this country; but there was no danger in these cases, although the symptoms were severe. The fish which are the most frequently injurious in this country, are all the kinds of edible shell-fish, especially mussels, cockles, periwinkles, lobsters, crabs, and crawfish. And either of these, when kept too long after having been boiled, or when only parboiled and reboiled after various intervals, as sometimes practised by the lower dealers, will produce more or less disorder. Salmon and eels are also sometimes poisonous, but the former is injurious chiefly when out of season, or when insufficiently preserved.

429. *a.* The *symptoms* produced by poisonous fish differ much in different persons; and certain of the effects observed are more or less owing to idiosyncrasy; but the most violent and fatal operation is not so frequent, if at all, owing to this cause. (*a.*) Thirty persons were poisoned by mussels in Leith in 1827, and of these two died. The symptoms were carefully observed and described by Dr. COMBE. No one complained of any thing peculiar in the smell or taste of the mussels, and none suffered immediately after eating them. An hour or two or more elapsed, and then the bad effects consisted rather in uneasy feelings and debility, than in distress referable to the stomach. After eating two or three, and various numbers above this, the lowest number, slight tension at the stomach, with heat and constriction of the mouth and throat, was complained of. These were succeeded by a difficulty of swallowing and speaking freely, by prickly feelings in the hands; by numbness about the mouth, gradually extending to the arms, with great debility of the limbs. Two or three had cardialgia, nausea, and vomiting; but these were not general or lasting symptoms. The muscular debility was present in all the cases. An unpleasant taste was felt in the mouth. There was slight pain in the abdomen, on pressure, especially in the region of the bladder. The secretion of urine was suspended in some cases, in others it was free, but passed with pain or effort. The action of the heart was feeble, the breathing was unaffected. The face was pale, and expressive of anxiety; the surface somewhat cold, the mental faculties unimpaired. One of the two fatal cases died in three hours, the other in six or seven hours. In one case only did the symptoms of irritation pass into those of inflammation of the digestive canal. The instance which was treated by me within the tropics, was characterised by constant vomiting, by remarkable loss of muscular power, by rapid failure of the heart's action, coldness, and clamminess of the surface, and sinking, with intermissions of the pulse. This form of fish-poisoning may be called the *paralytic*, or vitally depressing, this condition predominating over the irritant.

430. (*b.*) In the other form of poisoning by fish,

cutaneous eruptions, with or without asthma, or asthmatic symptoms without external eruption, are generally present, and signs of local or general irritation predominate. From one to two or three hours after eating the fish, especially mussels, uneasiness, or sense of weight at the epigastrium; heat, and constriction of the mouth and throat, with thirst; numbness, prickings, and itchings of the surface, particularly of the extremities; difficulty of breathing, lachrymacation and swelling of the eyelids, and an eruption resembling urticaria are complained of, but sometimes the eruption is papular, sometimes vesicular, and it is always attended by heat and itching. These symptoms are sometimes attended by vomitings, by colicky pains and diarrhœa; but these are often absent, or of short continuance. In the cases related by MOHRING the eruption was preceded by dyspnœa, lividity of the face, insensibility and convulsions. In Dr. BURROWS's cases, the symptoms began with dyspnœa, nettle-rash and swelling of the face, conjoined with vomiting and colic; delirium and convulsions supervened, and death took place in three days. In MOHRING's cases the symptoms appeared in a few minutes; in those by Dr. BURROWS, not until twenty-four hours after eating.

431. (*e.*) Fish kept too long before or after having been cooked, or otherwise spoilt, especially salmon and shell-fish, has, in two or three instances which I have observed, produced symptoms, differing more or less from the two forms of fish-poisoning now described. The poison causing the above effects exists in the fish when cooked, is present in the fresh or live state, and is not produced by changes that have taken place, either after death or after cooking. But the injurious effects occasioned by such changes as occur after the death, or the cooking of the fish, are different from the foregoing; and are not attended by either the rapid sinking of vital power on the one hand, or the dyspnœa and eruption on the other. The injurious operation, in the circumstances now stated, very much resembles an attack of colic, with vomiting, or an attack of cholera; there being generally severe vomiting with griping pains, occasionally purging with cramps of the extremities, much debility, and sinking of the pulse; but these latter symptoms are not so severe as in the first form, and death has not occurred in any of the cases which I have seen.

432. *b.* The *source of the poison*, in these cases and forms of fish-poisoning which are produced by fresh fish, has been a matter of speculation. In the numerous cases observed by Dr. CONNE the mussels were fresh, plump, and healthy-looking; and Dr. CHRISTISON analysed some of those which were taken from the stomach of one of his patients without being able to detect a trace of copper — to which the poisonous operation of fish has been attributed. That idiosyncrasy has, as Dr. EDWARDS contends, something to do with the injurious effects of fish, is true in few or rare instances. Dr. CHRISTISON remarks, that a relation of his could not partake of salmon, trout, herring, turbot, or lobster, without being attacked with violent vomiting; and several instances of the kind have been mentioned to me by persons who have possessed this peculiarity; to which, however, fish-poisoning cannot be imputed in the great majority of cases. In the nearly fatal case seen and treated in a most intimate friend now living, who was never disordered by any kind of fish on any other occasion, and has always been in the habit of partaking freely of every kind of fish, no such idiosyncrasy existed. The mussels, which proved to be poisonous to thirty persons in Leith, were minutely examined by Drs. CHRISTISON, CONNE, and COLDSTREAM; and it would appear that nothing particular was detected in their appearance; excepting that the liver appeared much larger, darker, and more brittle than in the wholesome fish. The poisonous mussels were all taken from one spot, and every person who partook of them was more or less severely affected, according to the number who ate of them. Animals suffered as severely as man, a cat and dog having been killed by them. It is very probable that, as respects these mussels, and perhaps also as regards some other shell-fish, the poisonous principle exists in the liver, as suggested by the statement of Dr. CHRISTISON, but what that principle is has not been ascertained. In the cases of poisoning of two women by mussels, M. BOUCHARDAT states, that he detected sufficient copper to account for the effects; but it is not detected in most cases; and even when present, the quantity found is too small to account for the poisonous effects on the human subject. There can be no doubt, as I have suggested above, that much of the injurious effects of various kinds of shell-fish, eels, &c., arise from a sickly state, produced by the means used to bring them alive to market; and that the choleric and colicky symptoms described (§ 431.), as being often produced by salmon and other kinds of fish, arise chiefly from changes subsequent to the death and cooking or preserving of the fish.

433. *c. The treatment of fish-poisoning* should depend much upon the time that has elapsed from the eating of the fish until the commencement of the symptoms; and this may vary from a few minutes to twenty-four hours, or even more. If the period has been short, and the fish still remains on the stomach, an active emetic, as mustard, or the sulphate of zinc, should be given with a large dose of capsicum, and the vomiting encouraged by means of diluents conjoined with stimulants, aromatics, spices, &c. The elapse even of a long period between the ingestion of the fish and the appearance of disorder, should not prevent a recourse to emetics, for the fish may, in its poisonous state, remain long unchanged in the stomach. If vomiting has taken place without the aid of an emetic, it should not be considered sufficient unless there has been an abundant discharge of undigested or other matters, the treatment now advised being required nevertheless. If the irritability of the stomach become excessive, it will be of no avail to attempt to remove it by means of opium and effervescing draughts, unless they be conjoined with powerful stimuli and warm spices; for this state of the stomach is always in fish-poisoning attended by sinking of the vital powers, especially of the heart's action, and by colicky pains and flatulent distension of the bowels. Powerful stimulants, aided by warm embrocations, rubefacient epithems, or sinapisms, over the epigastrium and extremities, are then required. I believe that capsicum — the true cayenne — or small-bird pepper — is an antidote to fish poison, when taken freely. In the nearly fatal case, which I treated within the tropics (§ 429.), after other means had failed to allay the vomitings and rally the powers of life, and after brandy and

water had been thrown off the stomach, a teaspoonful of powdered *cayenne* was mixed in a tumbler full of brandy and water (equal parts of each), and taken at a draught. All the symptoms were instantly mitigated, and next day nothing more than debility was complained of. That the constant vomitings attending this and some other states of poisoning is owing to more than irritation — is owing in some degree to exhaustion of vital power, is shown by the instant arrest of both the nausea and the vomitings by so powerful an excitant as that now mentioned; and which I have prescribed in somewhat similar conditions with equal advantage. I have employed this spice, especially in an early part of my practice, and in malignant diseases, in very large doses, believing that it is not so irritating to the stomach as its impression on the nerves of the mouth and palate would indicate, but that, on the contrary, it imparts a salutary stimulus to the digestive canal, and counteracts the influence of many depressing agents. If the poisonous fish have passed into the bowels, causing colicky pains, flatulent distension of the abdomen, and sinking of the vital powers, enemata, containing spirits of turpentine, with castor oil; and, in extreme cases, asafœtida or capsicum, or both, should be administered and repeated according to circumstances, and the warm turpentine embrocation or epithem ought to be applied over the abdomen.

434. *B.* POISONOUS MEATS. — Certain kinds of meat are sometimes poisonous even in a fresh state, independently of any disease. Others are poisonous owing to some disease of the animal at the time of death. Others again are injurious in consequence of changes which have occurred after the animal has been killed, — these changes arising either from the deposit of the ova—or exuviæ of insects — from fly-blowing, or from decomposition, or the more slowly developed combinations of the elementary particles which take place in imperfectly preserved or salted provisions, especially in sausages, dried meats, bacon, &c. The secretions of certain animals are poisonous during their lives, especially those possessed by them for the purposes of self-preservation; and the fluids and secretions of others are sometimes poisonous, both during life and after death, owing to the nature of the disease of which these animals are the subject. These latter infect the healthy, contaminating the fluids and soft solids. They are fully considered in the Articles, BLOOD, DISEASE, and INFECTION, and in those devoted to the specific forms of disease to which they give rise. Some notice is also taken of certain of them when treating of *Septic Poisons.*

435. *a. Fresh pork* is often injurious, and gives rise to various symptoms according to the idiosyncrasy of the individual, and to the manner in which the animal had been fed. In the East, especially in warm climates, pork is often injurious and productive of diarrhœa and dysentery; effects which I have seen caused by it in several instances in this country. The Mosaic law forbade the use of it; and there can be no doubt of the wisdom of this law as respects warm countries, and I believe as regards all countries. — The *poisonous effects* of fresh pork vary. In the most severe cases it has produced a dry and burning sensation in the throat, with heat and pain in the stomach, retchings and vomiting; a sense of sinking at the epigastrium; a weak, small, and irregular pulse; coldness of the extremities, a cold and clammy perspiration, and colicky pains in the abdomen and around the umbilicus. In other cases the pain has been confined to the stomach alone, or it has been situated in some other part of the abdomen. In addition to these symptoms there have sometimes been remarkable swelling of the face extending over the scalp without any vesication or redness, swelling and tenderness of the abdomen, an eruption resembling urticaria over the breast, legs, and arms, and a quick sharp pulse. In rarer instances, there have been neither retchings nor vomitings, but severe colicky pains and sinking of the pulse and vital powers. Such were the more acute cases of poisoning with pork, and of which Dr. M'DEVITT has detailed six cases, all of which were produced by fresh or recently salted pork, and especially by roasted pork. He believes that the injurious effects are produced chiefly by the fatty parts; but I have reason to believe that the viscera are still oftener injurious.

436. The symptoms may appear any time from three or four to thirty hours after the ingestion of the meat. When the symptoms are delayed until seven or eight hours after the pork has been eaten, they much resemble those of either violent colic or enteritis, and are attended by a sense of sinking or of impending dissolution, and a weak intermitting pulse, &c. In other cases, especially when a longer period than this has elapsed from the ingestion of the poisonous food — from twelve to twenty-four hours — diarrhœa, or an attack resembling cholera, or dysenteric symptoms of a severe character, have taken place. In many instances the symptoms are slight, especially when the offending article has been evacuated speedily by vomiting or by copious evacuations from the bowels; and even when the symptoms assume an alarming character, the discharge of it, when fully accomplished, is followed by immediate relief of all the symptoms. When only one, of several of those who have partaken of this food, has been thus affected, then we may infer either that the affection is owing to idiosyncrasy, or that the part eaten by the individual has been tainted or otherwise changed; but I am acquainted with occasions on which great numbers of persons, as a large portion of a regiment of troops, have been affected, after eating fresh pork, some very severely, with the symptoms above described, or with diarrhœa, or colic, or dysentery.

437. *b. Bacon* seldom produces symptoms of *acro-sedative* poisoning unless those parts of it generally on, or near to, the surface, which have undergone change during the process of preserving, or near the large vessels. Mr. TAYLOR states, that one fatal case from poisoning by bacon occurred in the metropolis in 1836; and I have seen very severe effects produced by a minute portion of a spoilt or rusty part of ham or bacon having been swallowed. But equally severe and nearly similar symptoms have followed the ingestion of a very small piece of either *mutton* or *veal*, when fly-blown or otherwise changed. Mr. TAYLOR states, that meat of any kind, when too recently killed or decayed, may produce severe effects and even death. I believe, however, that decay, unless far advanced or connected with the deposition of the ova or exuviæ of insects, or the generation of mouldiness, or the lowest forms of animal life in the preserved articles, will not produce of itself the severe symptoms constituting acute or fatal poisoning.

438. *c. Animal substances of various kinds* :

become poisonous, owing to changes during their preservation, which Dr. CHRISTISON has called a "*modified putrefaction*." In Germany and other countries, where animal substances are preserved by drying and smoking chiefly, and without much salt, some unknown injurious principle appears to be developed in these substances from the combinations of their elementary particles during the process of preservation. The articles in which these injurious changes have been observed are sausages, bacon, and hams, dried mutton and beef, cheese, smoked salmon, and various other dried or preserved animal substances.

439. (*a.*) *Sausages* have proved most frequently poisonous; but it is possible that they may, at least in some instances, have possessed this property independently of any changes during their preservation, and that it may have existed in the flesh or viscera of the animal, especially the pork, when quite fresh, of which the sausages were made. This circumstance is rendered the more probable by the accounts of three cases which terminated fatally from the effects of sausages made with the liver of an apparently healthy pig slaughtered only a week before. The *inspection* of the bodies threw no light on the more immediate cause of death in these cases. (*Lond. Med. Gaz.* Nov. 1842.) — But the poisonous effects so frequently observed in Germany to be produced by sausages more evidently are developed by a modified putrefaction or by a combination of the elementary particles, taking place during the process of preservation, and different from the usual states of putrefaction. The sausage-poison has been described by Dr. CHRISTISON from the materials furnished by KERNER, DANN, and HORN. In a period of little more than thirty years, 234 cases of sausage poisoning occurred in the state of Würtemburg, and of that number 110 proved fatal. Those sausages which have been found poisonous have usually been of large size, and cured by drying and smoking with wood. They become deleterious in the spring after they have been long kept, and been alternately frozen and thawed; and are poisonous only at a particular stage of decay, and cease to be so when putrefaction has fully advanced. Those that are poisonous possess an acid reaction, are soft, have a nauseous putrid taste, and an unpleasant sweetish-sour smell. The central parts are chiefly deleterious, these parts being poisonous even when the surface is wholesome.

440. (*b.*) The *poison of cheese*, as observed in several continental countries, and rarely in this, appears to be developed by analogous changes in the curd to those observed in sausages; and is more probably developed by a partial decomposition having taken place in the curd before it was subjected to pressure, than by any change subsequently to this process. Dr. CHRISTISON thinks that the cheese-poison is occasionally met with in Cheshire, where among the small hill-farms the limited extent of the dairies obliges much of the curd to be kept for several days before the quantity required for large cheeses is accumulated.

441. *d. The symptoms* produced by spoilt *sausages, cheese, bacon, hams,* and *salmon,* which has become partially decomposed before, or after being cured, are probably very nearly the same in respect of each of these articles; but they have [illegible]e frequently and precisely observed and described as regards the ingestion of spoilt sausages. Generally, the effects of these are not manifested until twenty-four hours, or two, three, or even four days after they had been eaten. This tardiness of operation is probably owing to the difficulty of digesting them, and the slowness of their absorption. The first symptoms are pain in the stomach, vomiting, purging, dryness of the mouth and nose, and hoarseness, or loss of voice. Deglutition becomes difficult and painful; the pulse fails, swoonings ensue, and the skin is cold and ultimately insensible. The eyes, eyelids, and pupils are almost motionless. The secretions and excretions are at last suspended, but often profuse diarrhœa continues throughout. Fever is rarely present, and the mind continues unaffected. Fatal cases end with convulsions and oppressed breathing between the third and eighth day. In cases of recovery, convalescence is very long protracted.

442. *e. The appearances on dissection* have been described as observed in cases of sausage-poisoning. There are usually signs of inflammatory irritation in the internal surface of the digestive canal. The throat is white and dry; the œsophagus thickened; the stomach and intestines reddened, and croupy exudations are formed on the surface of the trachea. The heart is flaccid; and the body is said to resist putrefaction. But it is evident, from this account, that the structural changes consequent upon poisoning by these articles of food have not been observed with due care and precision.

443. *f. The treatment of poisoning by pork, or by sausages, preserved meats, and other articles too long kept or imperfectly preserved,* should not differ materially from that recommended for fish-poison. The chief indication is to procure the discharge of the offending substance as speedily as possible, by means of the emetics conjoined with the warm spices already mentioned (§ 433.). If it be inferred that it has passed the pylorus, the enemata advised for fish-poison, and the external applications also recommended, should also be resorted to. In cases of poisoning by these substances, *creasote,* conjoined with warm spices, with small doses of opium, and with ipecacuanha if diarrhœa or dysenteric symptoms appear, will be found of great service, especially when the stomach becomes irritable. In most cases also, mustard poultices, or turpentine epithems, over the epigastrium or abdomen, will be of service; and they ought never to be omitted in the more acute and dangerous cases.

444. *C.* DISEASED ANIMAL SUBSTANCES, FLUIDS, SECRETIONS, &c. — *a. The flesh of over-driven animals,* especially if these animals have been deprived of drink for some time before they were killed, and probably also their viscera, produce injurious effects, especially in cachectic constitutions. But according to the experiments of M. MORAND, the flesh of such animals is perfectly wholesome when cooked and eaten, although the application of the blood, or raw flesh, to a scratch or wound, or even to the sound skin, is often followed by dangerous or fatal effects — sometimes consisting of an eruption of gangrenous boils, the *pustules malignes* of the French, at other times appearing as diffuse inflammation of the skin, or of the cellular membrane, or of both.

445. *b.* The *viscera and offal* of animals occasionally produce analogous effects to these just mentioned, even on the unabraded surface. Sir B.

BRODIE has shown, that the contact of these with abraded or wounded parts may cause chronic states of erysipelas, &c. I have seen several instances of the scratches or pricks of the fingers of cooks by the bones of hares, or of other animals, and even abrasions of the skin, having been followed by inflammation of the absorbents or of the veins, or by diffusive inflammation of the cellular tissue.

446. *c. The flesh or viscera of diseased animals*, and especially of those which have died of endemic or epidemic distempers, are undoubtedly injurious, and even in some instances rapidly fatal. Mr. TAYLOR states, that four members of a family in Oxfordshire, in the spring of 1841, dined in good health upon part of a sheep which had died of a disease then prevalent among cattle. The symptoms which followed this meal resembled those of irritant poisoning, accompanied by others indicating an affection of the nervous system. One of the patients, a child, died in less than three hours, the others recovered. There was no poison discovered in the food, nor in the body, nor was any poisonous vegetable used at the meal. (*Op. Cit.* p. 214.)

447. *d.* There are certain districts in North America, in which the *milk and flesh of animals*, especially cattle, acquire poisonous properties from the grass on which they feed. The disease thus produced in persons who partake of this poisonous food, has been named in America the "milk-sickness," or "trembles." These districts lie to the west of the Alleghanies, and those who venture within them are obliged to abstain from the flesh of the cattle within the same limits, as well from the milk and its preparations. It appears from the report of Drs. HOSACK, POST, and CHILTON, that the inhabitants of some of these districts, with a reckless disregard of human life, carry the butter and cheese, which they dare not themselves eat, to markets at a distance; and that thus symptoms of poisoning, and even death, for which the medical attendant cannot account, are frequently produced. According to the same report, the cattle from these districts are sent in great droves over the mountains, but, in order to deceive the purchasers, they are sent to New York by a southern route. The flesh of these animals occasion aggravated symptoms of cholera. "The viscera of these cattle are often found diseased; the livers most generally so." Owing to the symptoms of poisoning which have followed the use of beef, butter, and cheese from these districts, the American government caused a medical inquiry to be instituted into the matter, and the reporters recommended the sale of these articles to be prohibited. In the event of this recommendation being adopted, it is not improbable that the poisonous food may be exported to England. (See *Edin. Med. & Surg. Journ. for July*, 1844.)

448. The above interesting and important fact is an ample illustration of what has been stated by some physiologists, namely, that certain secretions may acquire poisonous properties from the nature of the ingesta, without the individual appearing to be materially disordered. I have repeatedly had occasion to observe, that the *milk of a nurse* has produced all the symptoms of slow poisoning, occasioning vomiting, diarrhœa, and sinking of vital power, with or without convulsions in the child which she suckled; and that this state of the milk has not been occasioned alone by the nature of the ingesta, but also by the more violent mental emotions. That the nature of the food may thus affect the secretions, without materially disordering the animal, is further shown by the poisonous nature of the *honey* in some districts, as that of Trebizond, which is said to be collected from poisonous plants. I believe that the deleterious effects of pork are chiefly owing to the unwholesome nature of the food upon which the animals had lived for some time before they were slaughtered.

449. *e. Poisonous honey*, especially as met with in Trebizond, causes, according to Mr. ABBOT, violent headache, vomiting, and a condition resembling intoxication. A large dose produces deprivation of all sense and power for some hours afterwards. These effects agree with those mentioned by XENOPHON, in his account of the "Retreat of the Ten Thousand." PLINY also takes notice of this poisonous honey. TOURNEFORT ascribes this property to the bees feeding on the *Azalea pontica*. (*Lond. & Edin. Philos. Mag.* vol. v. p. 314.) The poisonous effects of honey have also been observed in North America, by Drs. BARTON and HOSACK, who consider that the injurious property is owing to the various species of *kalmia*, the *Andromeda mariana*, the *rhododendron*, the *Azalea undiflora*, and the *datura* on which the bees have fed. The *symptoms* mentioned by Dr. BARTON are dimness of sight, or vertigo, succeeded by a delirium, which is sometimes mild and pleasant, and sometimes ferocious; ebriety, convulsions, with foaming at the mouth; pain in the stomach and intestines, vomiting, purging, and, in a few instances, death. Sometimes vomiting is among the earliest symptoms, and in that case the patient is readily relieved, although a temporary weakness of the limbs remains. (*American Philosoph. Trans.* vol. v. p. 65.) In the cases recorded by Dr. HOSACK, the chief *symptoms* were violent vomiting, cold extremities, a livid appearance of the countenance; the pulse having been remarkably reduced. In these instances the honey was of a dark reddish colour, and of thicker consistence than usual. (*Edin. Philosoph. Journ.* vol. xiv. p. 91.)

450. *f.* The treatment of poisoning by the *flesh of diseased animal* (§§ 444—448.), judging from the fects or symptoms as far as they have been described, should not materially differ from that which I have recommended for poisonous fish (§ 433). Having expelled the injurious substance by emetics, and by purgatives and enemata, if it have passed the pylorus, the powers of life should be developed by means of the tonics, stimulants, aromatics, spices, external applications, &c., there prescribed; and especially quinine, camphor, capsicum, and opium.— In the cases of *poisoning by honey*, just noticed, the efforts of nature suggested the best remedy, namely, the early discharge of the injurious substance from the stomach and bowels, by emetics and purgatives. I believe that, in all cases of poisoning by injurious articles of food, the best purgative that can be employed is, a combination of spirits of turpentine, castor oil, and capsicum, taken on the surface of coffee, or some aromatic water; enemata, containing the same medicines, being also administered according to the circumstances of the case.

451. vi. MINERAL AND SALINE ACRO-SEDATIVES. —*A.* THE ANTIMONIAL COMPOUNDS act as irritants

of the surface or part to which they are applied, and, owing to their absorption chiefly, and probably also to their more immediate influence upon the nervous systems, they depress vital power and vascular action. The *chloride of antimony*, the preparation which is the most corrosive and irritant, has been noticed above (§ 175. *et seq.*), and shown to be injurious principally in consequence of its local effects. But the other officinal preparations of antimony exert a much more remote and extensive influence, more especially the *potassio-tartrate*, the *sesquioxyde*, the *oxysulphuret*, or kermes mineral, and the *compound antimonial powder*, which was intended to represent the empirical powder of Dr. JAMES. The medicinal properties of these preparations differ more or less; but, when given in excessive doses, the first, or the *potassio-tartrate of antimony* may be considered as representing their injurious effects, both local and constitutional. When treating of it, therefore, my observations will apply also to the other compounds of this metal.

452. *a.* The *antimony-tartrate of potash*, or *potassio-tartrate of antimony*, or *emetic tartar*, is a powerful irritant when applied to any part, or even to the cutaneous surface, in a state of minute division or strong solution; and generally causes an eruption of painful pustules resembling those of ecthyma or small-pox, and various constitutional changes, according to the dose and the mode of employing it. As this preparation is the most prescribed, it is of importance that its *local* and *remote effects* should be well understood. — (*a.*) When applied to the *cutaneous surface, emetic tartar* gives rise to somewhat different results according to the mode of its application. In a state of strong solution it occasions an eruption of small semi-globular painful pustules; in that of powder sprinkled over a plaster or mixed in an ointment, the pustules are larger, and, when fully developed, are flattened, with a central dark point, contain a puriform serum and an albuminous deposit, and are surrounded by an inflammatory border. The central dark point soon extends, and forms a dark crust as desiccation of the pustule advances, that is afterwards thrown off. The internal use of this substance in large or poisonous doses sometimes gives rise to a similar pustular eruption, or to aphthous spots, in the mouth, fauces, pharynx, œsophagus, and intestines, but more frequently to redness, and other inflammatory changes in the gastro-intestinal villous surface; attended by pain in the region of the stomach extending over the abdomen, and by vomiting, followed by purging.

453. (*b.*) *The constitutional or remote effects* of tartar emetic and other antimonial preparations vary with the dose. In *small doses* emetic tartar increases the secretions of the liver and pancreas, and the secretions and exhalations of the gastro-intestinal villous surface; and as it passes into the circulation, it increases subsequently the perspiration and the mucous and urinary excretions. In *larger doses* it excites nausea and vomiting, relaxes the skin, and augments the mucous secretions and exhalations. In still larger quantities it depresses the organic nervous energy, relaxes the muscular structures, and all the tissues, and gives rise to general exhaustion. With its emetic operation it occasions distressing nausea, and sinking, and is sometimes uncertain in the amount of its effects, the emetic action being slight, whilst the depression and diarrhœa produced by it are extreme. *Excessive doses* of this substance have acted as a violent irritating and depressing poison, and produced death, especially in children, and infants when it has been given frequently, and in too large quantities for this class of patients; the sinking of vital power and death, which have in no rare instances ensued, having been mistaken for the progress and result of disease. ORFILA states that in one case a scruple, in another, twenty-seven grains nearly proved fatal, and that forty grains caused death. The symptoms in these were vomitings, pain and tumefaction of the epigastrium extending over the abdomen, hypercatharsis, delirium, convulsions, and, in the fatal case, death on the fourth day.

454. The above should be viewed as the effects of this substance on the healthy body only, for it has been found that, in states of inflammatory excitement, in local inflammations, and fevers attended by high vascular action, the system will tolerate quantities of tartar emetic, which have been productive of the most dangerous effects in other conditions of the œconomy. This salt has been given in enormous doses by RASORI in these states of disease, and the statements of this physician have been partially confirmed by LAENNEC and others. I have attempted, however, to give very large doses of it in pneumonia; but, if I advanced above five or six grains in the twenty-four hours, distressing diarrhœa and depression followed the emetic action of it, and I have been obliged to desist. Some source of fallacy must exist, as regards either the purity of the medicine, or the retention of it in the stomach and bowels, from either of which it may have been more or less completely rejected; or then we must infer that an excessive quantity of it acts less energetically than a very small dose — an inference which receives no support from the external application of it, or when it is administered or applied so that its operation, especially as an irritant, may be subjected to the senses of the observer. It should, however, be noticed, that in cases of oppression of the brain, and of coma, large doses of this salt may be given without producing vomiting, and, if fever be also present, without occasioning any very remarkable effect, until dangerous sinking of the powers of life, or diarrhœa, or both appear. This is the more apt to occur in children and young subjects, and requires more attention than it has received.

455. The symptoms produced by antimonials taken in poisonous doses are, in the majority of instances, such as have been just described; but when taken in states which may affect the mouth or palate, a strong metallic taste is perceived in the mouth, both at the time of swallowing and afterwards; and even during convalescence from large quantities, this taste sometimes continues, with an aphthous eruption in the mouth and fauces. There are generally also syncope, small, weak pulse, great prostration of strength, cold, clammy perspirations, vertigo or tremor; spasms of the extremities, convulsions, in the more dangerous cases; and these symptoms generally precede death in fatal cases. Dr. BECK mentions an instance in which fifteen grains of tartar emetic killed a child. I am confident of having seen fatal effects follow the exhibition of a smaller quantity, given in divided doses, in cases of croup to which I had been called.

456. *b.* Tartar emetic, when injected into the

large bowels, or into other mucous canals, produces nearly similar effects to those already described; and is also, in these circumstances, absorbed into the circulation, through the medium of which, as well as when injected into the veins or introduced into wounds, it acts specifically upon the stomach, producing, as M. MAGENDIE has shown, a very decided action on this organ, when thus employed. When applied to the skin, in the form of powder, or of strong solution, to produce an artificial eruption, it rarely occasions any constitutional effects of a severe character, or resembling those occasioned by the ingestion of a poisonous dose. Yet such effects have occurred, and have been attended by nausea and vomitings, and even by diarrhœa.

457. *c. After death*, the villous surface of the stomach and duodenum has been found reddened and covered by a slightly adhering layer of mucus. Mr. TAYLOR states, that in a man who had taken forty grains of tartar emetic within a period of five days, and who then had died apoplectic, the stomach was found much reddened and inflamed in irregular patches, the redness passing into a violet tint; but there was no ulceration of the internal membrane; the duodenum was in a similar state, and the small intestines were but slightly inflamed. In animals poisoned by this substance it is usual to find inflammation of the gastro-intestinal mucous surface.

458. *d. Treatment.* — The evacuation of the poison from the stomach by the stomach-pump, or by encouraging vomiting by irritating the fauces, or by the free administration of warm water, milk, or demulcents, should be enforced. Any vegetable infusion containing tannin, or an infusion of green tea, oak-bark, or of the yellow cinchona-bark, may be given freely; as the tannin combines with oxide of antimony to form an insoluble compound, thereby suspending the operation of the poison. But Dr. PEREIRA states, that although cinchona decomposes emetic tartar, it does not destroy the activity of this salt; for that, in many instances, from one to two grains of the salt were given with the yellow bark, and nevertheless nausea or vomiting occurred. In most instances of poisoning by the preparations of antimony, opium is most beneficial, especially when conjoined with small doses of camphor, and even of capsicum when the depression is urgent. Mustard epithems on the epigastrium, and the warm bath, and several of the other measures advised for the removal of the effects of other substances already considered under this class, will also be found of service.

459. *B.* BARYTA AND ITS SALTS are poisons of which but little is known as to their operation on man. Pure baryta is met with only in the laboratory of the chemist; but it is a caustic poison. The principal salts are the chloride, nitrate, acetate, and carbonate, the last of which is insoluble. The sulphate is said not to be poisonous as it is insoluble; but, as Mr. TAYLOR remarks, it would be well to establish this by experiment, since insolubility ought not to be received as evidence of the inertness of any substance, although it is erroneously assumed to be so, and is the chief basis of the doctrine of chemical antidotes. Arsenite of copper and calomel are as soluble as the sulphate of baryta, and yet they act powerfully on the body. The instances of poisoning which have occurred from baryta have been caused by the chloride and the carbonate.

460. *a.* The *symptoms* produced by the *chloride of baryta* were a combination of irritation of the alimentary canal, and severe affection of the nervous system, especially vertigo, convulsions, and paralysis. In one case half an ounce was fatal in two hours. In another, one ounce destroyed life in an hour. It has been found to affect the system powerfully even in small doses. ORFILA has shown that the chloride of barium is absorbed, especially when given in small or moderate doses. He states that he has found it in the liver, spleen, and kidneys of animals killed by it.

461. The *Carbonate of Baryta* is said to have been fatal in two cases, in each of which one drachm only was taken. But, in a case recorded by Dr. WILSON, it appears not to have been nearly so virulent. A young woman swallowed half a tea-cupful of the powdered carbonate mixed with water. She had fasted for twenty-four hours. The powder had no taste. In two hours she had dimness of sight, double vision, ringing in the ears, pain in the head, throbbing in the temples, with a sensation of distension and weight at the epigastrium, and palpitation of the heart. She afterwards complained of pain in the legs and knees, and cramps in the calves. She vomited twice a fluid like chalk and water. The skin was hot and dry, the pulse frequent, full, and hard. These symptoms gradually subsided, and she recovered, although the pain in the head and epigastrium continued long. — (*Lond. Med. Gaz.* xiv. p. 488.)

462. *b.* The *morbid appearances* produced by the salts of baryta have not been described as they occur in man. In the lower animals the mucous membrane of the stomach is usually found of a deep-red colour, unless death has taken place very rapidly, and in this case the alimentary canal is healthy. In all the animals which in Dr. CAMPBELL's experiments were killed by the chloride applied to wounds, the brain and its membranes were much injected with blood; and in one of them the appearances were those of congestive apoplexy.

463. *c.* The *Treatment* of poisoning by the salts of baryta consists chiefly in the speedy administration of an alkaline or earthy sulphate, as the sulphate of soda or of magnesia. The poison is thus converted into the insoluble sulphate of baryta, which, if not altogether inert, is nearly so. But the alkaline sulphates are but of little service where he carbonate of baryta has been taken, unless in procuring the more rapid discharge of the poison by the bowels. In Dr. WILSON's case, just mentioned, the copious evacuations from the bowels consequent on the exhibition of the sulphates were evidently beneficial, and tended to the recovery of the patient. Unless the patient be seen early, any treatment will prove inefficacious. Where the carbonate of baryta has been taken, Mr. TAYLOR recommends recourse to emetics and the stomach-pump; or, as chemical antidotes, a mixture of vinegar with an alkaline sulphate.

464. *C.* COPPER, THE PREPARATIONS AND COMPOUNDS OF, have been considered above (§§ 205. *et seq.*) with reference to the corrosive and acute action of these substances when administered in large doses or quantities. But, in smaller quantities, or in repeated doses, they act locally as irritants of the gastro-intestinal villous surface, and constitutionally as sedatives or paralysers of nervous and vital power; this latter effect resulting both from

the influence primarily produced by them upon the nervous systems, and from their operation through the medium of the circulation, upon the heart and nervous centres. The cupreous compounds are most likely to act in this way, and in a chronic form, when they contaminate articles of food, as remarked on many occasions. The salts of copper which are the most frequently administered in large doses for the purposes of suicide and murder, are the *sulphate* and *subacetate*, and these act chiefly as corrosive acute poisons as stated above (§ 205.). But these, as well as the other compounds of this metal, may be so employed or administered, as to produce the symptoms most characteristic of *acro-sedative* poisoning.—*a.* Inmost instances the gastric symptoms are similar to, but not so severe as, those attending the corrosive operation of the poison, whilst the nervous symptoms are of longer duration. There are generally burning pain in the throat and stomach, anxiety, vomitings, acute pains and great swelling of the abdomen, but no diarrhœa; afterwards painful and difficult deglutition, with swelling of the throat and face, oppression of the pulse, salivation and ulceration of the gums, spasms, convulsions, or paralysis, sometimes jaundice, &c. The irritability of the stomach and cramps, or paralysis, often continue long, and are attended by costiveness and dysuria or suppression of urine.

465. *b.* The *sub-chloride of copper*, oxychloride or Brunswick green, is sometimes formed when common salt has been used in a copper vessel, and in this way, as well as when employed as a pigment, it has given rise to accidental poisoning. A boy of three years swallowed about a scruple of this salt. Vomiting and coldness of the extremities followed and continued until death. On dissection there was no change indicative of the action of an irritant poison, excepting slight congestion of the vessels of the brain.

466. *c.* Copper vessels are acted upon by articles of food or drink, especially if these articles contain saline substances, or acids, or become acid whilst kept in these vessels. Thus wines which are more or less acid, substances containing vinegar, or any other acid, soups or broths, especially if they contain vegetable matters, and are liable to become acid, and fatty substances, when kept only for a short time in copper utensils, are not infrequently productive of accidental poisoning. FALCONER and others have shown that metallic copper undergoes no change by contact with water unless air be present, when a hydrated carbonate, mixed with oxide, is formed. When an acid, or an oily or fatty matter is in contact with the metal, then this change more rapidly takes place, and the liquid or fat acquires a green hue. Hence no acid, oily, or saline liquid, should be prepared or kept in copper vessels. Nor should fruits, pickles, or preserves, be either kept or prepared in them. The quantity of the poison which may be formed in these circumstances may not be sufficient to produce fatal poisoning, but they may be quite enough to cause severe gastro-nervous, or acro-sedative effects. GMELIN was consulted respecting a violent disease which prevailed among a whole brotherhood of monks. The symptoms were obstinate and severe cholic, retching and bilious vomiting, flatus, costiveness, burning pain in the pit of the stomach, under the sternum, in the region of the kidneys and extremities, with paralytic weakness of the arms. He found, on inquiry, that all the kitchen vessels—the pots, pans, milk pail; and butter dishes, were made of copper. Similar instances of culinary poisoning have been mentioned by CHRISTISON and other writers.

467. *d.* It is stated by Mr. TAYLOR, that the use of the alloy called *German silver* which is a sort of *white brass*, consisting of copper, zinc, and nickel, and containing about 50 per cent. of copper, may be productive of acro-sedative poisoning where articles, as spoons, made of this alloy, are allowed to remain in contact with acid, oily, fatty, or saline substances. A lady in Paris, in 1838, after having had eels for dinner, was awakened in the night by headach, nausea, followed by vomiting and colic. Her physician ascertained that the eels had been cooked with butter and vinegar in an earthenware vessel; and he found the spoon, which was of German silver, presenting on different parts greenish spots. Chemical analysis showed that a poisonous salt of copper had been thus produced; and the fact was further proved by polishing the spoon and placing it in a similar mixture. Half an hour afterwards green spots were perceived on the spoon, and in twelve hours it was quite green, as well as the butter in contact with it.

468. *e. Arsenite of Copper, or Scheele's Green*, being extensively used as a pigment, both in the arts and in confectionary, has occasioned dangerous effects. Dr. GEOGHAGAN informed Mr. TAYLOR, that fourteen children in Dublin, in 1842, suffered symptoms of poisoning owing to their having eaten confectionary ornaments coloured with this substance; and jaundice followed in two or three of those cases. Three lives were nearly sacrificed at a school near Manchester by the same cause: they suffered from violent vomiting, severe pains in the stomach and bowels, and spasms of the extremities.

469. The green colour of the matters vomited, in cases of poisoning by the cupreous compounds, has been mistaken by some for bilious vomiting. But this colour is generally owing to the poison, and not to the presence of bile in the vomited matters; for the bile is generally obstructed, and the liver and intestines more or less paralysed by the influence of the poison on the organic nerves, as shown by the jaundice, and by the flatulent and colicky distention of the abdomen in these cases.

470. *f.* The *modus operandi* of the cupreous compounds appear to vary with the preparation, with the quantity swallowed, and the state of the stomach at the time, as respects especially the quantity and nature of the contents of this viscus. They certainly produce, as shown above (§ 207.), a corrosive action on this organ when taken in large quantities, and in other circumstances favourable to that action; whilst, in other cases, this action is but slight, the fatal issue chiefly resulting from the change produced by them in the nervous system. Their organic action, or the disorganization produced by them locally, is mainly owing to their chemical combination with the albumen, or with one or more of the animal tissues. They evidently also affect the nerves of the part with which they come in contact, altering the innervation of the surface or viscus. They are also more or less imbibed by the surfaces and tissues and carried into the circulation, thereby further depressing and otherwise changing the irritability and innervation of the structures, the poisonous

action of the cupreous salts being produced in this way chiefly, especially when given in repeated doses, or applied to a wound, as shown by the absence of corrosive or other local effects, and by the fact of these salts having been detected in the blood and viscera of animals poisoned by them. Dr. DUNCAN found that the application of the sulphate to a wound produced death in twenty-two hours, and yet the body appeared every where in a healthy state; but SMITH and ORFILA state that the acetate applied to wounds caused only local inflammation.

471. *g.* The *diagnosis* of cupreous poisoning is of some importance, seeing that the symptoms caused by it closely resemble those produced by arsenic and corrosive sublimate. According to ORFILA, the first symptoms occasioned by the compounds or salts of copper is violent headach, which is followed by vomiting and cutting pain in the bowels, and by cramps and pains in the legs and thighs. Generally there is a coppery taste in the mouth and throat, and an aversion from the smell of copper. Jaundice is a common symptom, and is never observed in poisoning by arsenic or sublimate. Fatal cases terminate with palsy, insensibility, and convulsions. This order of the symptoms is, however, by no means generally observed; for the headach often does not appear until after the vomiting; and the paralytic state, either of the sensibility or the power of motion, is often early. The chief diagnostic signs on which any reliance can be placed, are the coppery taste of the mouth, with a peculiar astringency and watering of the throat, with ulceration in the more chronic cases; vomitings and eructations of greenish, or greenish-blue matters, and frequently jaundice, or slight yellowness of the surface, which, however, does not appear in some cases until after death.

472. Cupreous substances, when taken in minute quantities for a long time, or when used by workmen who are inattentive to cleanliness, according to the observations of PATISSIER, MORAT, and others, are productive of a greenish sallow hue of the countenance; of an infirm and decrepit state of the body; and of severe attacks of colic, with partial or slight palsy; the children of persons thue rendered infirm being ricketty and puny.

473. *h.* The *appearances on dissection* of fatal cases are most varied and uncertain. In some, the corrosive action of the poison already described (§ 207.) is the most remarkable, especially in the stomach and duodenum. In others, equally or even more rapidly fatal, little or no structural change of these viscera is observed; nor even inflammatory appearances of the stomach and bowels are met with. In the majority of instances, however, the alimentary canal is more or less inflamed; and it very commonly presents a greenish hue, especially the stomach, œsophagus, and duodenum. The external surface is generally jaundiced or slightly yellow. The blood is of a dark hue, and fluid in some cases, and coagulated in others. The lungs and the sinuses of the brain are more or less congested; and the brain is sometimes more vascular than usual.

474. *i.* The *Treatment* of the slow or acro-sedative form of poisoning by cupreous substances should be based chiefly on the method stated above (§ 208, *et seq.*). After the evacuation of the poisonous substances as there advised, albuminous and saccharine substances should be given, and irritability of the stomach ought to be quieted, as it tends remarkably to lower the depressed vitality of the frame, by opium conjoined with camphor and creasote, and by external derivatives applied over the epigastric region. If inflammatory action be manifested, the usual local and general measures indicated by the state and associations of this condition ought to be prescribed.

475. *D.* SALTS OF POTASH.—*a. Chromate of Potash.* — *Crome—Bi-chromate of Potash.* — This salt is extensively used in dyeing; yet poisoning by it is rare; but instances have been recently recorded. A concentrated solution of it causes all the symptoms and structural changes of corrosive poisons. In small doses it occasions vomiting, diarrhœa, paralysis, and death in the course of some hours. It appears to be more or less absorbed, and to depress and otherwise affect nervous and vital power. In a case described by Mr. WILSON, of Leeds (*Lond. Med. Gazette*, v. xxxiii. p. 734.), where a large quantity of this poison had been taken, the poisoned person not having been seen until soon after death, the countenance was pale, placid, and composed; the eyes and mouth closed; the pupils dilated; no marks of vomiting or diarrhœa, nor discharge from any of the outlets of the body, nor any stain upon his hands or person, or upon the bed-linen, or furniture, could be detected. On *dissection*, a pint of turbid inky fluid was found in the stomach. The mucous membrane of this organ was red and very vascular, particularly about the cardiac orifice. The brain, its membranes, and all the other viscera were quite healthy. The contents of the stomach furnished the chromate or analysis. In this case, the chrome produced neither vomiting nor purging, and did not act by any irritating influence; but by its sedative action entirely. Hence it may be viewed as causing, according to the dose, state of the stomach, and other circumstances, either a decided corrosive effect, or an acro-sedative action, or even a purely sedative or fatally depressing operation. The *treatment* appropriate to poisoning with this salt is recourse to emetics or the stomach-pump, and to the administration of magnesia or chalk, mixed in water.

476. *b. Nitrate of Potass.* — TARTRA denies that this salt possesses any poisonous properties; and it is stated to have been given, for medicinal purposes, in doses varying from six to twelve or even sixteen drachms in the twenty-four hours. — (*Med. Chirurg. Rev. April*, 1844, p. 549.) As it is much employed in the arts, accidents occasionally occur from it; and, in a large dose, as when taken in mistake for some purging salt, serious or even fatal results may be produced by it, although its effects are somewhat uncertain. Two men swallowed each one ounce of nitre by mistake for Glauber's salts, and almost instantly experienced a sense of coldness in the course of the spine, trembling in the limbs, with vomiting and purging; the stools were bloody. They recovered in the course of a few days. In another case recorded in the same work an ounce of nitre was fatal in thirty-six hours. — (CASPER'S *Wochenschrift*, *b.* xviii. 1841.)

477. The *symptoms* and *structural lesions* produced by a poisonous dose of this salt will appear from the following details: — M. ORFILA states that a lady took an ounce of nitre by mistake, and in a quarter of an hour suffered nausea, vomiting, and purging; and the muscles of the face were

convulsed, the pulse weak, respiration laborious, and the extremities cold; but there was a burning pain in the epigastrium. She died *three hours* after taking the salt. On *dissection*, the stomach was found inflamed and the villous coat detached in places. Near the pylorus the inflammation approached to gangrene. A large quantity of fluid, coloured with blood, was found in the stomach.—Dr. GROOHEGAN communicated to Mr. TAYLOR the following case.—A man took, by mistake for salts, from an ounce to an ounce and a half of nitre. Severe pain in the stomach followed with violent vomiting, but no purging. He died in about *two hours* after taking the salt. On examination a bloody mucus was found in the stomach; the villous coat was of a brownish red colour, generally inflamed, and detached from the subjacent coat in places. None of the poison was detected in the stomach; but its nature was determined by the analysis of the portion left in the vessel from which it was taken. It is evident that the rapidity of the fatal result in this case was owing to the extent of the local injury, to the shock sustained by the constitution, and to the absorption, in a very short period, of so large a quantity of the salt into the circulation; this salt being rapidly absorbed, especially in solution, and acting not merely as an irritant, but also as a powerful sedative.

478. *c. Sulphate of Potass*, according to Mr. MOWBRAY (*Med. Gaz.*, vol. xxxviii. p. 54.), is much employed in France as a popular abortive, and when thus administered has proved not infrequently poisonous. It has also been employed in this country with the same object, and in one case, at least, with the same results, as shown by Mr. TAYLOR. In one case two drachms acted most powerfully, and in another four drachms, administered to a lady after her confinement acted as an irritant poison. Another lady took, about a week after her delivery, about ten drachms of this salt, in divided doses, as an aperient. After the first dose she was seized with severe pain in the stomach, with nausea, vomiting, purging, and cramps in the extremities. These symptoms became augmented after each dose, and she died in *two hours*. On inspection the villous surface of the stomach and intestines was found pale, except the valvulæ conniventes, which were reddened. The stomach contained much erddish liquid, which was found to contain only sulphate of potass.

479. *d. Oxalate of Potass.—Salt of Sorrel.—Binoxalate of potass* is an active poison, owing chiefly to the oxalic acid. It is much employed under the name of "essential salt of lemons," and instances of poisoning have occurred from its having been taken by mistake, some of which have been adduced by Mr. TAYLOR. The following case is recorded by Mr. JACKSON. A female, aged 20, took about an ounce of this salt in solution. About an hour and a half afterwards she was found on the floor quite faint, having been very sick. The nature of the poison was soon ascertained, and four ounces of mistura cretæ were administered. She was then in a state of extreme depression; the pulse could hardly be felt; the skin was cold and clammy; the lips and face were pale, and rigors continually affected the whole body. She complained of a scalding sensation in the throat and stomach, of pain in the back, of soreness of the eyes and dimness of vision. The conjunctivæ were injected and the pupils dilated. She was wrapped in warm blankets, æther, tincture of opium and camphor were administered, and reaction took place. The patient afterwards recovered. Most probably the greatest part of the salt had been thrown off the stomach before she was found. The treatment of this case throughout was as judicious as successful.—(*Med. Gaz.* v. xxvii. p. 480.) A lady, recently confined, took by mistake an ounce of this salt. She had scarcely swallowed the dose when she was seized with violent pain in the abdomen and convulsions; she died in eight minutes. The mucous membrane of the stomach and small intestines was found inflamed. A tea-spoonful of this salt was taken for three successive mornings, and produced severe vomiting; about an hour after the third dose the patient expired. There was no examination of the body. It is evident from these cases, that this salt is a powerful acro-sedative poison; its depressing operation being most energetic.

479*. *e. Bi-tartrate of Potass.—Cream of Tartar* is a most useful medicine, even in large doses; but it may be poisonous if a too large quantity be given. I have prescribed as much as two drachms three times in the day, in cases of dropsy connected with obstruction in the liver, with great benefit; but this dose should not be continued long, and its effects should always be carefully watched. Mr. TAYLOR states, on the authority of Mr. TYSON, that a man took four or five table-spoonfuls of cream of tartar, and was seized with violent vomiting and purging, with pain in the abdomen, thirst, feebleness of pulse, and a paralysed state of the thighs and legs. The fluid vomited was of a dark green colour, and the motions had the appearance of coffee-grounds. Death took place in forty-eight hours, and, on *inspection*, the villous coat of the stomach and duodenum was found highly inflamed; the cardiac portion of the stomach being of a deep red colour, with spots of black extravasation. This organ contained a thick brown fluid, coloured by bile. The intestinal canal was more or less inflamed.

480. *f.* The *nitrate of soda*, the *sulphate of magnesia*, the *biborate of soda*, the *chlorids of sodium*, and other salts, which are harmless in small or moderate quantities, are injurious, and act as irritants and depressants when taken in large or excessive doses, especially in states of disease or of constitution which are favourable to their injurious operation.

481. vii. THE SULPHURETS OF POTASSIUM AND SODIUM. — *The alkaline sulphurets* have very rarely occasioned poisoning in this country; but they have caused fatal accidents in France, where they are frequently employed for baths and for the manufacture of artificial sulphureous waters. They act as powerful irritants of the digestive mucous surface and depressants of nervous and vital power, exhausting at the same time the irritability of contractile tissues. These latter effects are in great measure owing to their absorption into the circulation. M. ORFILA and M. CAYOL have recorded cases of poisoning by these sulphurets. The quantity taken in each of these was three drachms and upwards. Two of the cases terminated fatally in less than *fifteen minutes*, the other patients who recovered were dangerously ill for some days. The rapidly fatal effects of these poisons were probably owing more to the change produced by them in the state of

organic nervous influence, than to disorganization of the villous coat of the stomach.[9]

482. *a.* The *symptoms* in these cases were burning pain and constriction in the throat, gullet, and stomach; frequent vomiting; at first sulphureous, the air of the chamber being tainted with *the odour of sulphuretted-hydrogen*, and afterwards sanquincolent; purging, at first sulphureous, afterwards mucous and bloody; sulphureous exhalations from the mouth; acrid taste on the palate; pulse quick, afterwards feeble, fluttering, and almost imperceptible; followed, in the cases which recovered, by inflammatory reaction of the digestive canal, extending to the œsophagus; and by mortal faintness and convulsions in the fatal cases.

483. *b.* The *structural changes* in the fatal instances were great lividity of the face and extremities, and loss of the muscular contractility immediately after death. The stomach was red internally, and lined with a crust of sulphur. The duodenum was also red. The lungs were soft, gorged with black fluid blood, and did not crepitate.

484. *c.* The *treatment* seems to consist in the instant administration of any diluent at hand, and frequent doses of common salt. If inflammation of the stomach, &c. supervene, local and general antiphlogistic measures and external derivatives will be required. Dr. Christison observes, that the chloride of soda may be called the antidote against this poison, as it decomposes the sulphuretted hydrogen which is evolved; the rapid disengagement of which he considers to be the cause of death in the quickly fatal cases. The chloride of lime is equally efficacious with the chloride of soda.

485. viii. Tartaric Acid. — Oxalic acid in small doses, and tartaric acid in large quantities, are productive of nearly similar effects. *Tartaric acid* has, until lately, been regarded as not poisonous. But an instance lately occurred of this acid having been given to a man instead of aperient salts, in the dose of one ounce, with fatal effect. The whole of this swallowed at once dissolved in warm water. He immediately exclaimed that he was poisoned; complained of a burning pain in the throat and stomach, and compared the sensation to that of being all on fire. Soda and magnesia were administered with diluent drinks. Vomiting commenced and continued until his death, which took place nine days afterwards. Tartaric acid was found in the dregs of the cup; and the person who made the mistake admitted the act and the substance which he had thus given. On *inspection of the body*, nearly the whole of the alimentary canal was found inflamed. — (See Taylor *in Op. Cit.* p. 104.)

486. The *Treatment* of poisoning with this acid is the same as that for *oxalic acid* (§ 166.), which when given in smaller quantities than those usually productive of the corrosive action described above (§§ 160. *et seq.*), is partially absorbed, and, with its local irritating operation, occasions also marked depressing and paralysing effects; and either an acute, or sub-acute or chronic form of poisoning, according to the quantity taken, the circumstances of the case, and the treatment employed soon after its ingestion. In the slower form of poisoning by *oxalic acid*, as well as that by *tartaric acid*, as soon as the poison is removed by vomiting or the stomach-pump, remedial measures should not be confined to the removal of the local irritation merely that is produced by it, but ought to be extended to the restoration of the nervous and vital powers which are more or less depressed by the influence of the poison on the nerves of the alimentary canal, and, by absorption, upon the heart, nervous centres and constitution generally; and with these intentions the means already recommended for the more energetic acro-sedatives will be found the most successful for the removal of the consecutive effects, and for the slower forms of poisoning caused by small doses of oxalic acid, and by large quantities of tartaric acid.

487. ix. The Necroscopic Poison. — Poison imbibed from recently dead Bodies. — *A. Source and nature of the poison.* The fluids of bodies recently dead, or that have not passed into an early stage of decomposition, not infrequently produce the most dangerous effects, especially when they come in contact with an abraded surface, or are inoculated in any way. The effects vary with the disease of which the person died, with the constitution of the infected individual, and with other circumstances. I have had several occasions of observing and treating the effects of this species of animal poison. Since I first published my views as to the nature and treatment of these effects, in 1823, and again in 1833, I have been more fully convinced of the accuracy of these views; and moreover, they have received the support of experienced observers, and especially of Mr. Travers, in more recent publications. The poisonous action of the fluids of dead bodies is most acutely exerted when these fluids are inoculated; but they sometimes act upon the perfectly sound skin — there being no scratch, puncture, or abrasion through which they could be introduced; the existence of either of these greatly facilitating and aggravating their operation. In the observations I offered respecting this poison, (in the *London Medical Repository for July*, 1823,) I stated, — 1st. That this poison is distinct from any other animal poison, generated or transmitted during life; — 2nd. That it is different, in its nature and effects, from putrid animal matter; — 3rd. That it does not appear to exist in the blood, either during life or after death; — 4th. That it is produced during the changes which are more immediately consequent upon the loss of life; — and 5th. That it is present, chiefly, in the secreted and exhaled fluids on the surface of membranes, especially serous membranes, or in cellular or parenchymatous parts. I then remarked that, as respects the distemper inoculated from another body which has recently ceased to live, and as regards the nature of the animal poison which causes the distemper, and the manner of its operation, it may be inferred, that it is produced by the textures before their vital properties and cohesions are quite extinct, because putrid animal matters occasion different and less dangerous effects; — that as all morbid poisons possess certain properties bestowed on them by the organic nervous or vital influence of the vessels and structures secreting them, in consequence of previous disease either of these parts or of the frame generally, which properties they preserve for a time until the elementary particles composing them enter into different combinations, so may the secretions and fluid exhalations occasionally experience, during the period in which organic nervous influence and vitality are forsaking the tissues which secrete them, such a change as amounts to the acquisition of virulently poisonous properties, —

and that these fluids, thus changed, affect the nerves of the part to which they are applied, and, consecutively, the whole frame; the cellular tissue in the vicinity of the glands above the seat of inoculation generally evincing more or less disorganization, and sometimes, also, the integuments, the fasciæ and tendonous sheaths, the absorbents or veins, or both, and even the serous surfaces of adjoining cavities. This poison being productive of the most dangerous effects, and on numerous occasions, it is of the utmost importance, especially to medical men themselves, that its operation and its counteraction and treatment should be carefully investigated.

488. *a.* The poison communicated by recently dead bodies has been described, and illustrated by the details of cases, by Dr. Duncan, as constituting a form of diffusive inflammation of the cellular tissue, and by Mr. Travers, as occasioning a variety of constitutional irritation. But the doctrine inferred from these denominations is too restricted to be applicable to the distemper which this poison developes. Diffusive inflammation of the cellular tissue certainly often exists as a consequence of the contamination produced by the poison; but it is preceded and attended by constitutional effects — by states of the circulation and nervous system — of the most malignant or virulent description. Constitutional irritation is equally present, and is certainly more or less immediately consequent upon the local irritation, impression, or alteration, or whatever the local effect may be; but so are depression of organic and cerebro-spinal nervous power, changes in the states of vascular action and of the blood, asthenic inflammation of the cellular tissue, and often also of the integuments, or of the absorbents or veins, or of adjoining serous surfaces. The truth is, that this poison produces an almost specific effect upon the tissues in the vicinity of glands above the seat of its application; but this effect may be limited to the cellular tissue, or extended to several other tissues; it may be confined to the axilla, or extended to more deep-seated parts; it may not implicate, in a visible manner, any of the structures of the arm, although the poison was inoculated in the finger, and the cellular tissue in the axilla is most extensively diseased, no change between these situations being detected; and it may most virulently affect the nervous and vascular systems and depress vital power and resistance, when the local changes are the least extensive or apparent.

489. *b.* It is of some moment to know the *diseases which impart this poisonous property* to the recently dead body; but, as to this, we have no precise information. Although the distemper which is the result has most frequently been produced by the inoculation of the fluids of bodies which had died of inflammations of serous surfaces, or of erysipelas, or of puerperal diseases, yet has it occurred also after the inoculation of the fluids of bodies which have died of other visceral or inflammatory maladies — of enteritis, peritonitis, &c. More than one person have even been infected by the same dead body, this occurrence evincing a greater virulence of the poison in that body, owing either to the nature of the disease of which it died, or to the period after death at which the examination was made. That this has probably depended chiefly upon the former of these causes may be inferred from its frequent occurrence when the body has died of erysipelas, puerperal peritonitis, or other states of puerperal fever; whilst on the other hand, there is equal, if not stronger, reason to believe that the poison imbibed in dissection is not the result of diseased action, simple or specific, in the living subject, but is altogether generated immediately after death; although certain diseases may favour its generation at this period. That the poison is not the result of the disease of which the patient died is shown by the facts, — 1st. That this poison has been imbibed during the examination of bodies of persons who have died suddenly, and in health, in consequence of accidents — that poisonous effects have been produced by the fluids of a body which has been killed by an accident, or has died of a non-contagious disease: — 2d. That the distemper developed by this poison presents a specific character, differing only in the degree of severity and the extent of the contingent local inflammation, whatever may have been the malady of which the subject which furnished the poison died. Still the larger proportion of cases of this distemper have their origin from the fluids of bodies recently dead from inflammations, by which an abundant exudation of morbid fluids is accumulated, and in which the thoracic and abdominal viscera are examined and handled. In most instances which have fallen under my observation, the bodies from which the poison was imbibed were still warm when examined; and many of them had died of puerperal diseases. Mr. Travers remarks also, that the subjects were recent. Not one had been buried; some were yet warm. Even of those in which demonstration, not inspection, was the object, the bodies were in a perfectly fresh state; and he remarks a circumstance, which has also struck me, namely, that when the dissection has been performed before the body has entirely parted with its warmth, a faint and peculiarly oppressive odour is emitted, which is disagreeable, not to say revolting, even to persons habituated to dissection, and which not infrequently creates nausea.

490. *c.* The question may be asked, Whether or not the poisonous fluid may produce its effects when applied to the *perfectly whole cutaneous surface*, or only when this surface is punctured, or the cuticle abraded, in the part which comes in contact with it? I can answer this question in the affirmative from my own experience, and from statements made to me by others, in the frequent habit of making inspections. I have seen severe constitutional disorder of the specific kind produced by this poison in two instances, in which the subjects had died of puerperal disease, the surgeons who assisted me in the examinations, and who thus imbibed the poison, having had no abrasion of the cuticle whatever. The fluids accumulated in the serous cavities occasioned, in these two instances, a sensible smarting over the surfaces with which they remained for a time in contact. But I believe that such instances are rare compared with those which are owing to some scratch, abrasion, or puncture of the cuticle.*

* The following cases, abridged from Mr. Travers's work, are remarkable, as they are examples of a distemper, in the local and constitutional symptoms, closely akin to, if not actually identical with, that produced by the poison imbibed from recently dead bodies, although the poison, in the second and third cases, was imbibed from the secretions of the first case, whilst she still lived.

491. *d.* Another question suggests itself, namely, *whether or no this poison is the same as the infectious emanation which caused the disease of which the person died — is allied to a specific contagion existing still in the body which has died in consequence of it?* We know that the poison under consideration is frequently imbibed from bodies which have died from puerperal diseases, from visceral inflammations, from erysipelatous and other maladies. But the distemper produced by this poison is not in any respect the same as any of these diseases, there being no further resemblance than in the febrile disturbance present in all of them, and in the vital depression and weak state of vital resistance. That small-pox, syphilis, erysipelas, glanders, and even scarlet fever may be transmitted by the recently dead body; and that the power of transmitting these specific contagions may be retained by the bodies which have died of them for a considerable but an indefinite time, I believe; but when the body is surrounded by clothes of any kind, this power of transmission is retained by the clothes rather than by the body itself; for, as soon as the latter undergoes decomposition, the power of transmitting the specific malady which caused death appears to have ceased, especially if there be a free admission of atmospheric air, because the contagious secretions are also decomposed, and, by their decomposition, have lost their specific and poisonous properties. It cannot, however, be inferred, that the distemper produced by the poison imbibed from recently dead bodies is allied to any of the maladies which has most frequently caused the deaths of the bodies from which the poison was imbibed.

492. *B. Symptoms.*—(*a*). In some cases, the following is the usual procession of morbid phenomena. — 1. A few hours after puncturing a finger in the examination of a body, pain is felt in the puncture. It soon increases to the utmost agony, and is attended by symptoms of constitutional irritation, the nervous system being agitated to a violent degree. No trace of inflammation, beyond slight redness of the puncture is observable; and no evidence of inflammation of the absorbents or veins can be detected. In a case recorded by Mr. Travers, death took place forty hours after the puncture was received, with all the symptoms of agonising excitation of the nervous system, the distemper resembling hydrophobia. — 2. In other cases, the puncture is also not attended by any evidence of inflammation, but, in ten or twelve hours afterwards, feelings of indisposition are complained of; violent rigors are soon experienced, followed by febrile reaction, nausea, or vomiting, and most rapid pulse. Severe pain is felt about the shoulder, axilla, or pectoral muscle; but no trace of inflammation can be detected between the puncture, generally of a finger, and the seat of pain. Anxiety, depression of spirits, delirium, profuse perspiration, singultus, most rapid and small pulse, insensibility and death supervene. — 3. In some instances, from ten or twelve to twenty-four hours after the imbibition of the poison, languor, depression, shivering, and sickness at stomach are experienced; a *vesicle*, or *pustule* resembling that of small-pox, is observed in the punctured or abraded part, and pain is felt in the shoulder or axilla, or both, but without any sign of inflammation of the lymphatics, or of any other tissue of the arm. The pain extends to the breast of the same side, and is attended by nervous excitement, thirst, watchfulness, headach, a hot and dry skin, a frequent and weak pulse, afterwards by delirium, irritability of stomach, by swelling, or redness about the axilla or pectoral muscle, by sinking of the powers of life, and often by death. — 4. In other cases, no vesicle or pustule forms in the seat of puncture, but severe constitutional symptoms are rapidly developed; the pulse in a day or two rises to 120 or 130, delirium soon appears; slight swelling and excruciating pain affect the axilla and breast, attended by diffuse swelling, patches of colour, and severe pain in different and distant parts of the body, by nausea and vomiting, by singultus, and sometimes by yellowness of the conjunctiva and skin; followed by a weak, small, and rapid pulse, exhaustion, laborious breathing, and death. — 5. In all the preceding *phases* of this distressing distemper, the puncture or abrasion by which the poison was imbibed, and the tissues in the vicinity have presented no alteration, excepting the superficial vesicle or pustule observed in some instances, and no local lesion or disorganization appears, until after the constitutional symptoms have been fully developed, and then it takes place near or on the trunk, in the situations already mentioned. But, in another class of cases the wound or puncture of the finger suppurates, not however until after severe constitutional symptoms have appeared, especially rigors, vomitings, pain in the axilla or shoulder, very rapid pulse, physical and mental depression, with white or loaded tongue, dry and hot skin, &c. The puncture or abrasion now begins to suppurate, and swelling extends along the finger and sometimes over the hand. Sphacelation of the cellular tissue, and often also of the tendonous structures, takes place; the pain in

— 1st *Case*. A female while suckling, had a poisoned wound of the finger, followed by pain, fever, and delirium. The pain extended from the finger up the arm, along the neck, to the tip of the ear. Matter formed within the proper sheath of the flexor tendon of the finger, and the wound in the finger continued to discharge freely after the sheath was laid open. Delirium, rapid pulse, &c. continued, and was followed by rigors and profuse colliquative sweating, and soon afterwards by extreme depression, and death. — 2d *Case*. The maid-servant who fomented this woman's hand, on the third day after the incision of the finger, complained of pain and tension of the point of the fore-finger of the right hand, with constitutional disturbance and delirium. She had neither wound nor scratch of any kind. Acute fascial inflammation of all the fingers, back of the hand and forearm followed, and abscesses formed, requiring free incisions. — 3d *Case*. A laundress who washed the sheets taken from the bed of the first of these patients, shortly before her death, "had no sooner opened and immersed them in water, than she was overpowered by an effluvium, which she described as peculiarly offensive, and instantly complained of a most severe darting pain in the axilla and shoulder. Nausea and faintness followed, and in the evening she had a rigor which lasted three hours. In the morning she was much fevered, and on the two succeeding nights violently delirious. The pain she now complained of affected the outer side of the upper arm, from the elbow to the shoulder, but there was neither redness nor swelling of this part." Afterwards the pain shifted to the axilla and pectoral region, and two days afterwards a deep pectoral abscess presented itself. She ultimately recovered. In neither of the second or third cases was there any breach of the cuticle, by which absorption of, or contamination by, a poisonous fluid could be facilitated. Mr. Travers adds, that the laundress was attacked at the one and the same instant with nausea and faintness from the stench, and with acute lancinating pain from handling the linen; and that a woman who was present informed him that the laundress turned as pale as death, and exclaimed with agony, from the pain she felt in the arm within two minutes of unfolding the sheets. I quite agree with this very able surgeon in remarking, that this was surely the operation of a subtle poison on the nervous system; as it is only through this medium, that it could operate so instantaneously.

the axilla or shoulder is followed by diffused and slightly coloured swelling, extending sometimes to the integuments of the same side of the body. As the disease continues, headach, watchfulness, delirium, irritability of stomach, thirst, and singultus, vary in severity; and, if no alleviation take place, these symptoms increase; the physical and mental exhaustion are extreme; restlessness, followed by insensibility and coma appears, and death takes place after periods varying from four or five to twelve or fourteen days.—6. In other cases, a diffused swelling, tension and redness affect the wounded finger, subsequently to the occurrence of severe rigors, prostration of strength, frequency of pulse, and other constitutional symptoms. The swelling, tension, and redness extend to the hand, or up the arm, upon which numerous vesicles form, followed by tumefaction, and insulated patches of colour on the shoulder, breast, and back, on the same side of the body. The febrile and the nervous symptoms continue to increase with the development of local lesions; and the pulse, strength, and constitutional powers generally become weaker, death taking place in the majority of cases after periods varying as just stated.—7. In some instances after the appearance of rigor, fever, nervous and other general symptoms, the axilla becomes painful and swollen. Diffusive inflammation proceeds extensively from this part through the cellular tissue, extending in some cases to both sides, and suppurates or sloughs; inflammation of and effusion into the pleura, often ultimately supervening. Death generally takes place in these cases, with the usual symptoms, and after the indefinite period already mentioned.

493. From the above brief account of the *several phases* of this dreadful distemper, it may be inferred that the local inflammatory action is an unessential and subordinate feature of the disease in its severest forms; that the distemper actually consists of prostration of the nervous influence and vital energy generally, the local irritation arising from the impression or imbibition of the poison occasioning slight change of structure in some instances, and more extensive inflammation and disorganization in others, as already noticed, and as will be more fully described; and that the contamination produced by this poison is characterized by preternatural excitement of the nervous and vascular systems, without power or vital resistance, that soon passes into rapid exhaustion. A circumstance deserving of notice in this distemper is the remoteness of the local inflammation, in the great majority of instances, and in all its above phases, excepting the sixth, from the part at which the poison is imbibed; and the absence of any sign of inflammation of the absorbents or veins in a great proportion of the cases between the seat of injury and that of pain and inflammation. But this phenomenon is also remarked in other maladies produced by a specific animal poison, as syphilis. It would appear that this poison, whether conveyed by the absorbents or by the nerves, especially those supplying the blood-vessels, affects the glands of the axilla, and probably also the axillary plexuses of nerves, in an especial manner, and that the surrounding cellular tissue becomes asthenically or diffusively inflamed in consequence, and the consecutive lesions are thereby produced.

494. *C. Prognosis.*—Much depends upon the severity of the constitutional symptoms at an early period of the distemper, and upon the treatment then adopted. Those cases in which the local affection is the least severe, and the nervous and febrile symptoms most prominent, are the most dangerous; and, if the disease be not arrested at an early stage by most decided means, these symptoms, and with them the local inflammation, rapidly increase and pass beyond the influence of any remedial means whatever.—*a.* The prognosis is generally most *unfavourable*, when the irritability of the stomach extends to the diaphragm and is attended by hiccup; when the tongue becomes brown or dry, or both; when the pulse rises above 120 in a minute, and is weak or small; when anxiety and mental depression are great, the features sunk, or the extremities cold; when a lurid, dirty, cachectic or yellowish hue of the countenance and general surface is observed, and more especially early in the distemper; when the individual has been previously out of health, is cachectic, or the subject of disease of the heart, or of a varicose state of the veins; and when delirium becomes continued, and is attended by unconscious evacuations. In these circumstances, few or no hopes of recovery may be entertained, but, nevertheless, active measures, such as I shall recommend, should not be relinquished. If these symptoms be accompanied with signs of extensive local disorganization, the chances of recovery are diminished, owing to the probable absorption of morbid matter into the circulation. Still energetic measures should be prescribed; but unless these measures are of a powerfully restorative kind they will be productive of no benefit, especially if hiccup be present; and even when most restorative they may fail, or may not be retained on the stomach, particularly at a far advanced stage of the distemper.

495. *b.* A more *favourable* result may be anticipated if the pain is less violent, if the pulse becomes less frequent, and the delirium is only present at night. If sleep be obtained, if the tongue continue moist, if singultus be not present, and if medicines be retained on the stomach, more sanguine hopes of recovery may be entertained. As respects the local affection, much will depend upon the rapidity and extent of its progress under the integuments and muscles of the affected side; and the amount of ease obtained from incisions, and the discharge of purulent matter. If the discharge be followed by a limitation of mischief or disorganization, and if the inflammation of the deep-seated cellular tissue has not implicated the pleura, it may be hoped that such measures as assist vital resistance may still prove successful, not only by arresting, but also by remedying the already existing disorganization. Of eight cases which I have seen of this distemper, seven recovered; but all these came under my care at an early period. The fatal case occurred in a gentleman who was the subject of varicose veins, and was otherwise cachectic. I saw him shortly before his death, which took place after a short period from the imbibition of the poison during the examination of a recently dead subject; the local symptoms in his case having been slight, but the nervous and constitutional disturbance most severe and rapidly fatal.

496. *D. Appearances after death.*—These have been but imperfectly described, and comparatively

few of the fatal cases have been examined. The lesions observed are, 1st, Those which are found in the external parts of the body; and 2d, those which are detected in the cavities and in the viscera.—(*a*). In the former, the changes are in some instances very slight, or hardly appreciable, unless in the vicinity of the axillary glands, in others most extensive. These changes may consist of serous infiltration of the cellular tissue surrounding these glands, which are generally more or less enlarged or inflamed, or both, or of a sero-puriform, or puriform infiltration, with or without destruction of the cellular tissue itself, as described in the article on diffusive inflammation of the CELLULAR TISSUE (§§ 20. *et seq.*). In some instances the disorganization proceeds so far between the pectoral and respiratory muscles as to implicate the pleura, the external surface of the *costal-pleura* being also inflamed. The *muscles* themselves are sometimes changed, especially in the vicinity of the sphacelated cellular tissue, or of the collections of puriform matter; the muscular fibres being of a dirty yellow colour, and devoid of cohesion. The *veins* are sometimes implicated, but seldom to a great extent, unless those which pass through the inflamed and disorganized cellular tissue. The *absorbents* between the puncture and the axillary glands sometimes betray no change, neither the superficial nor the deep-seated. In some instances, these vessels appear thickened or enlarged, and are, in various places, surrounded by sero-puriform, or puriform collections, in small quantities, in the cellular tissue. The *arteries* of the limb are rarely altered, excepting the smaller branches, which either supply the disorganized cellular tissue, or which traverse it. The state of the *nerves* has not been accurately observed, or has been reported as not materially changed; but in one or two instances the nerves of the arm, especially the internal cutaneous nerve, have been found inflamed. The *aponeuroses*, the *fasciæ*, the *theccæ*, and the *tendons*, have sometimes been found inflamed, or surrounded by, or covering, or containing puriform matter or pure pus. Lesions of one or more of these structures are chiefly seen in those cases, which are noticed as constituting the fourth, fifth, sixth, and seventh phases of the distemper (§ 492.); in many of those cases, which are ranked under the first, second, and third phases, these lesions, excepting those of the cellular tissue and axillary glands, are either wanting, or so slight as not to be remarked. The lesions of these several tissues are generally most remarkable, when the limb and external parts in the vicinity of the axilla present the more evident signs of disease or disorganization; and the symptoms during life vary with the texture, more especially implicated, as shown in the articles upon the diseases of these textures. In the majority of cases, and more especially when the poison has been imbibed from a very recent or warm subject, no alteration can be traced after death in the arm, or any connection between the abrasion or puncture of the finger and the changes existing in the vicinity of the axilla and pectoral muscles, more than could be observed during life.

497. (*b.*) If the external alterations have been but superficially observed, the visceral changes consequent upon this poison have been still more imperfectly described—if, indeed, described at all. The most prominent lesions have been observed in the *pleura*, particularly in that of the affected side, when the diffuse inflammation of the cellular tissue and its consequences have extended to the pleura. In these cases, the pleura is inflamed, generally throughout that side of the thorax, and the cavity contains a turbid serum, or a large quantity of bloody serum, with flakes of lymph floating in it. The inflammation extends from the costal to the diaphragmatic and the mediastinal pleura, and even to the pericardium, the pulmonary pleura being also inflamed. The *lungs* are rarely affected, but they have been found more or less congested. The *heart* has been seen somewhat flabby; and its right side and *vena cava* have presented inflammatory appearances. The stomach, intestines, liver, &c. are generally represented as natural; and the brain, spinal chord, and their membranes either have not been examined, or they are said to have been unaltered,

498. *E. Causes predisposing to infection by this poison.*—There are manifestly circumstances which predispose to the infection of this poison, and increase the virulence of the distemper produced by it. Attention to these causes may aid in preventing, or even in counteracting its effects. The operation of this, as well as of all animal poisons, is favoured by whatever lowers the powers of life or weakens the vital resistance to injurious agents, — by the depressing emotions, by fear especially, by disordered states of the digestive organs, or by accumulations of secretions and fæcal matters in the digestive canal; by a languid, impoverished, or an impure state of the circulating fluids; by general cachexia or anæmia; by fatigue, want of sleep or exhaustion of nervous energy; by excesses of all kinds; and by an irritable and susceptible state of the nervous system. Probably also idiosyncrasy, the nervous and irritable temperaments, a debilitated state of the frame, or natural delicacy of constitution or conformation, favour the morbid impression of this poison, and impart a greater intensity to its effects. My experience has shown that these circumstances are influential in the way now stated; whilst their opposites are equally influential in resisting the operation of the poison, or in rendering the effects less dangerous.

499. *F. Nature of the distemper.*—The constitutional symptoms are generally the same in all cases of this terrible malady, and differ merely in severity and the rapidity of their course. They always precede the more prominent local alterations, but become more severe with the progress of these. In addition to several other phenomena characteristic of this distemper, it is generally observed, in the more prolonged cases, that previously to a termination in death or recovery, swelling and inflammation affect a portion of the limb interposed between the original wound and the first seat of pain. The swollen parts present a redness very unlike that of erysipelas; for the tint is that of peach-blossom, and is very small in extent compared with the extent of the swelling, and is seen for a very short time — perhaps for a few hours only, never longer than a few days, on the same spot, and next is observed in some distant part, possibly even on the opposite limb. Besides, this peculiar redness, vanishing quickly from a part, does not leave any vesication or disquamation after it, as is seen in cases of erysipelas. When

the swollen parts are incised they yield only a small quantity of blood, or serum and blood, unless the incisions are delayed until the effused fluid assume a puriform character. On this topic Dr. Colles remarks that this peculiar disease, the effect of slight wounds received in dissection, presents much less of inflammation of the wound or its vicinity than occurs in the various diseases to which slight injuries more frequently give rise. Here the injury seems to produce mischief by exciting a fever, which in its turn induces a swelling and redness of very peculiar character, although at length (if the patient chance to survive) it will end in inflammation and suppuration of the wounded limb. (*Dub. Hosp. Rep.*, vol. iv. p. 247.)

500. Having seen the inoculation of this poison so frequently during examinations of puerperal subjects, and of persons who had died of erysipelas, the question suggested itself — Can the distemper which results be merely a form of erysipelas produced by inoculation? But this idea was met by the fact that it has been caused by wounds or abrasions received in the examination of recent subjects, irrespective of the disease which produced death, although my experience has shown that these maladies, and inflammations of serous membranes attended by fluid effusion, have most frequently occasioned it. There still remains much to be ascertained respecting it, before accurate views as to its nature can be entertained; for the changes produced in the nervous systems and centres, the appearances of the blood, both during life and after death, and the possibility of propagating a similar distemper by the serous fluids of the body of one who has died of it, or by the secretions during life, have not been investigated. Strongly impressed with the imperfect state of our knowledge of the pathology of this distemper, owing chiefly to the very superficial examinations of the bodies of those who have died of it; and to the general adoption of a very injurious practice in the treatment of it — a practice which has proved unsuccessful in the great majority of cases for which it has been prescribed, and which is yet persisted in with little variation, I would nevertheless suggest the following views as to its nature, especially as they have been the basis on which I laid my indications of cure in the cases which were treated successfully.

501. *a*. The poison communicated by, or imbibed from, a recently dead human body is of a specific nature, and produces a specific malady — specific more especially as respects the constitutional symptoms, and peculiar, as just shown, as regards the consecutive pain and inflammation in the axilla, arm and side.

502. *b*. This poison is connected with the secreted and exhaled fluids before they have undergone any change or decomposition, and before any of the properties imparted to them during life, or during the departing vitality of the frame has escaped from them; the loss during decomposition of properties derived from, or depending upon, the state of vitality, rendering them inert. In these respects — as regards the source of morbid properties, and the loss of those properties, the fluids producing this peculiar malady in every respect resemble the fluids infecting small-pox, measles, scarlet-fever, &c. — are identical with the infection of the exanthemata; decomposition or putrefaction destroying, whilst recent production increases, the poisonous properties.

503. *c*. There is every reason to infer, from facts already before the profession, that this poison exists, probably in various and varying grades of activity in the serous and exhaled fluids of all human bodies recently dead, whether from accident or disease, and irrespective of the nature of the disease; but that certain maladies, especially those in which the serous membranes and the circulating fluids are most liable to be especially affected, as puerperal diseases, erysipelas, peritonitis, &c. appear, in the present state of our knowledge, to cause this distemper the most frequently.

504. *d*. We do not possess evidence of this infection being communicated by a person labouring under the effects of the poison — by a living person*; and this may arise from the circumstance of the fluids, which are more especially or specifically infectious or poisonous, being those which exist in shut or serous cavities or in viscera, and which cannot hence be imbibed during life; although other fluids, exhalations or secretions, which are probably less poisonous or infectious, may communicate a modified or less virulent malady, as indeed seems to have been the case on some occasions, as noticed below.

505. *e*. The morbid impression made by the poisonous fluid imbibed from a recent subject, seems primarily to affect the nerves of sensation in connection with those of organic life; and, as these nerves are intimately associated with the vessels and absorbents of the limb, on the one hand, and with the ganglial system on the other, the morbid impression or irritation produced by the poison is followed by a general disturbance or tumult of all the functions actuated by the ganglial or the

* Dr. Nelson states, in his account of the illness of Mr. Newby, who died from the effects of this poison, that Mr. N.'s assistant had an erysipelatous inflammation of the fauces, and the pupil an attack of low fever, during the latter part of Mr. Newby's illness; that the housemaid was severely affected with cynanche tonsillaris; that the nurse had a slight attack of pyrexia, with pain and stiffness at the back of the neck, followed by erysipelas, which proved fatal; and that another who assisted just after Mr. N.'s death had also erysipelas, but recovered. Dr. Nelson adds, "Was the disease which destroyed Mr. N. erysipelas produced by inoculation and affecting the cellular substance of the breast and parts adjoining? Did the five cases which occurred during his disease and after his death, arise from erysipelatous contagion?" — (*Med. and Phys. Journ.*, Aug. 1823.)

Mr. Delph, surgeon, imbibed this poison from a woman who had died a few hours previously of visceral inflammation; the body being still warm when it was examined. The woman who nursed this person and washed the linen was seized with fever. Mr. Smart, who assisted Mr. Delph in this examination, was also attacked with symptoms of low fever on the second day afterwards, and with numbness and inability to move the right arm. The side became tender and swollen; the fever typhoid, and the sensorium much affected. During the early part of Mr. Smart's illness he was taken care of by a servant who happened to wound the index finger of the right hand. The wound became inflamed, swollen, and livid; and although early opened, much pus was discharged, and the extensor tendon had suffered. A tumour soon afterwards formed in the axilla, which was also opened. This man was removed to his father's house, and was nursed by his mother, who had an attack soon afterwards of inflammation of the hand, with much fever. In none of the above cases "were the absorbents of the arm inflamed, showing the red line which usually marks the track of the mischief from the punctured part into the system." — (Travers, *Op. Cit.* p. 327.)

organic nervous system, — by excessive vascular action, without nervous energy, or vital resistance, these states passing into exhaustion, with sinking of vital power, and contamination of the circulating fluids.

506. *f.* The primary impression of this poison is not only irritating, and productive of exquisite pain, in many instances, and of inordinate excitement in most, but it is also of a depressing nature, inasmuch as it often is followed by a numbness in the vicinity of the puncture, or by aching, or feebleness of the limb; the local change thus primarily produced being probably a chief cause of the consecutive changes which take place, especially after the frame is infected, in the glands and other structures in the axilla and its vicinity of the inoculated side.

507. *g.* The constitutional commotion, generally developed from ten to twenty hours after the imbibition of the poison, is displayed by all the organs actuated by the ganglial system, and by the brain, — both the organic and the cerebro-spinal nervous systems evince much disorder, and this disorder is characterised by altered or excited sensibility, and by deficient energy; the functions of vital organs being co-ordinately affected, vascular action, remarkably excited, and the blood, and all the secretions from it, ultimately more or less altered, as in malignant distempers.

508. *h.* The nature of the constitutional commotion — of the vascular excitement, in this malady, has been misunderstood by most practitioners and writers, and the character of the pulse misinterpreted; and, because there have been very acute pain, and remarkable frequency of pulse, often with delirium, many have most unwarrantably inferred the existence of sthenic or true inflammatory action, instead of its opposite, and had recourse to large vascular depletions, which have aggravated the pain, increased the frequency and weakness of the pulse, and induced or rendered more severe and continued, the delirium. Oh! that ignorance would be less presuming, and not actually inflict the death it is blindly attempting to prevent.

509. *i.* The state of predisposition of the poisoned person, depending upon temperament, constitution, and the existing health, is most probably influential in developing the primary impression, and the consecutive effects, or in aggravating their severity. This has been proved by cases which have come under my own observation, where surgeons, who have aided me in the inspection of very recent bodies, have either without any wound or abrasion of the cuticle, or after such injury, complained only of comparatively slight constitutional symptoms, which yielded to treatment, without the local symptoms having appeared.

510. *k.* In most cases no morbid connection can be traced between the puncture, or the point of inoculation, and the subsequent alterations which take place in the axilla and vicinity — no change is observed in any of the tissues between this situation and the puncture or scratch in the finger or hand; unless the change exist in some of the nervous fibriles, and be of such a nature as not to admit of recognition by the unaided senses. The constitutional commotion is generally ushered in by altered sensibility of the poisoned part, and of the arm, but is unattended by any visible change, although in some cases the absorbents, either superficial or deep-seated, appear to be affected, and is characterised by its early appearance and by remarkable physical and moral depression and anxiety, followed by rigors, which are succeeded by reaction and excessive nervous and vascular excitement, devoid of energy or vital power. The alterations which occur in the axilla and vicinity never commence until the constitutional disturbance is produced, generally after the rigors and consequent reaction, and are preceded by exquisite pain, often extending to the shoulder and arm.

511. *l.* The inflammatory changes in the axilla and vicinity do not take place in some of the most violent and dangerous cases; the poison, apparently not being intercepted by the glands, or affecting chiefly the nerves and exerting its noxious influence upon the nervous systems and constitution generally.* These changes are merely contingent upon the majority of cases, and do not constitute the disease; the constitutional affection not only preceding them, but being also over-proportioned to them. They are, moreover, in some instances, entirely absent, as in the first phases above specified (§ 492.). I therefore agree with Mr. TRAVERS in stating "that the local inflammatory action is an unessential and subordinate feature of the malady in its severest form; the disease itself consisting in a direct prostration of the vital forces, marked by preternatural excitement and rapid exhaustion."

512. *G. Treatment.* — It has been justly remarked by Dr. COLLES that, "whatever difference of opinion may be entertained as to the nature of this affection, it will be allowed that, although some few have escaped, yet the plans of treatment hitherto pursued have all proved quite unequal to contend with so formidable a disease." But the plan which he proceeds to advise has nothing to recommend it in preference to those which have been previously adopted, if, indeed, any definite or rational plan had ever been prescribed. The means which had usually been employed, consisted of blood-letting, general and local, opiates, fomentations, purgatives, &c. — the blood-letting having been prescribed for the insufficient reasons, that the pulse was rapid, and the febrile symptoms and delirium excessive — reasons more correctly indicating the propriety of adopting very different

* The following case illustrates this rapid and violent form of the malady: — Mr. E., medical student, punctured his finger in opening a body recently dead. This occurred at noon (of Monday), and in the evening of the same day he found the wound painful. During the night the pain increased, and symptoms of high constitutional irritation were present on Tuesday morning. No trace of inflammation, however, was apparent, beyond a slight redness of the spot at which the wound was inflicted, which was a mere puncture. In the evening he was visited by several physicians; but no local change could be discovered. The nervous system was agitated in a most violent and alarming degree, the symptoms nearly resembling the universal excitation of hydrophobia; and in this state he expired at three o'clock on Wednesday morning, forty hours from the injury. (TRAVERS *on Const. Irritation*, p. 262.)—This case, and other instances of a less violent character, seem conclusive of one of two things, namely, either that the poison acts upon, and affects the constitution through the medium of the organic nervous system, or that it is absorbed into the circulation in some cases without inflaming the absorbents or glands, or veins, occasioning the most severe effects upon the nervous system and vital energy, although inflammation of these structures, more especially of the glands and the surrounding cellular tissue, is often produced in consequence of the affection of the nervous system, or of the absorption, or of both.

measures. Dr. COLLES knowing that this treatment was most frequently followed by an aggravation of the malady, simply advises calomel, in doses of three grains every three or four hours, with the intention of quickly exciting ptyalism. But, despite of the magic number, three, he might consider himself most fortunate if he succeed at all in this intention, and "fortunate beyond compare" if he succeed either quickly or with a perfectly favourable issue.

513. The virulent poison imbibed from a recently dead body invades the healthy frame with a rapidity and intensity proportionate to the deficiency of vital power opposing the invasion; and whatever means are administered to the person infected by this poison, calculated to lower vital power and resistance, will only aggravate the effects by accelerating the absorption, and facilitating the operation of it upon the frame. All animal poisons exert more or less of an asthenic influence upon the healthy body—an influence which is not only morbid, not merely an alteration from the healthy condition, but also one of depression, a condition characterised by an imperfect as well as altered manifestation of the functions of life, and tending to the extinction of those functions. But when this primary effect is not so intense, relatively to the powers of life, as to overwhelm these powers altogether, they re-act against it, oppose it, resist its extension, and often completely overcome it. In many instances the impression made by the poison on the nervous system, and the contamination induced in the circulating fluids, lead to a violent struggle between these changes and the powers which resist them; the struggle ultimately terminating either in the removal of these changes or in the annihilation of the powers which have opposed them. Now, if I have observed and interpreted aright the phenomena produced by the poison in question, this is what actually occurs after the imbibition of it by the healthy frame, —*first*, asthenic and morbid action; *secondly*, vascular excitement, the morbid influence on the nervous and vital powers still continuing; and *thirdly*, disorganization and death, which are rapid in proportion to the invasion of the cause, and the failure of the vital powers of resistance. If it were asked—What are the measures which are most likely to increase not only the first and third of these effects, but also the second, I could not hesitate to answer, those very measures which have been hitherto too generally adopted to remove them. It may, however, be contended, that the re-action which supervenes requires to be moderated by blood-letting in order to prevent its exhaustion; but I have shown that the re-action is most morbid—is a tumultuous excitement, deficient of power or constitutional resistance; that the pulse is that of irritation—of what JOHN HUNTER would call constitutional alarm; that the blood is not inflammatory, and the coagulum is not firm; and, moreover, that the rapidity of the pulse, and the severity of the delirium, and all the other symptoms are aggravated by this measure; and are of such character, and are attended by such phenomena, as ought to suggest a very different method of cure.

515. When treating of *diffusive inflammation* of the CELLULAR TISSUE, I pointed out the means which should be employed, both as *prophylactic* and *curative* in the treatment of this disease, when connected with, or consequent upon, poisoned wounds. Since that article was written, my further experience has proved the correctness of my views, in respect both of the prevention and cure of the effects arising from the poison imbibed in the dissection of recently dead bodies, as stated in that article (§ 34. *et seq.*); and, therefore, I now only more strenuously advise the adoption of the principles and means of treatment there recommended.

516. *a.* The *prophylactic* means should be promptly applied, and should consist chiefly of a *ligature* applied above the puncture, scratch, or abrasion, when the situation of either admits of its application, or a cupping-glass, or even a common wine or ale-glass, may be applied in other circumstances, the air being excluded in the usual way, or suction and pressure may be employed. Afterwards the wound should be carefully washed, and a pledgit of lint, wet with spirits of turpentine, placed over it. This application I have found more efficacious than any other, and it is not productive of any local irritation. When these measures have not been taken, or not taken sufficiently soon, the part wounded should be viewed as still containing a portion of the poison, and be subjected to them, although several, or even many, hours may have elapsed; and the constitutional powers ought to be fortified by means of pure air and generous living.

517. If *constitutional disturbance* should appear notwithstanding, or if it have already appeared owing to a neglect of prophylactic treatment, it should be promptly met, by stimulating diaphoretics conjoined with tonics; and by warm or stomachic aperients, conformably with the principles maintained when discussing the treatment of diffusive inflammation of the *cellular tissue* (§§ 34. *et seq.*), and of the *lymphatics* (§§ 17. *et seq.*). The decoction of cinchona therefore should be given with liquor ammoniæ acetatis and full doses of the sesqui-carbonate of ammonia; and the bowels evacuated by means of a draught with equal parts of the spirits of turpentine and castor oil, and of an enema, containing the same substances, with, or without ten grains of camphor. These may be subsequently repeated according to circumstances.

518. *b.* The chief *intentions of cure* are, *first*, to prevent infection; *secondly*, to resist the extension of the mischief if infection have actually taken place; and, *thirdly*, to relieve the urgent symptoms both constitutional and local, which usually appear when the disease is fully and unfavourably developed. The *first* of these having been premised, the *second* should be energetically employed, notwithstanding the tumultuous state of the vascular excitement, or the delirium, which may be present. The medicines just recommended ought to be early prescribed, and the dose of the ammonia suited to its effects. Instead of the combination of the cinchona now mentioned, the decoction may be given with the chlorate of potass and the hydrochloric æther; and either of these combinations may be aided by the addition of camphor, by warm aromatics, by spices, &c., more especially by capsicum, which often prevents or alleviates the sickness and irritability of the stomach, and even the singultus of a more advanced stage of the distemper. If these do not relieve the disorder of the stomach, creasote should be given

with camphor, capsicum and small doses of opium, these medicines being generally indicated, when restlessness, watchfulness, or delirium supervenes. When, however, this last symptom appears, the doses of these substances ought then to be increased; and the morphia substituted for the pure opium or its tincture; full doses of these being given shortly before bed-time. Morphia or opium, or such of the preparations of opium as may be prescribed for the nervous symptoms of this malady, should be given in a very full dose, and conjoined with camphor or with capsicum or other warm spices, a full dose being given in the evening, and a smaller one in the morning. The infusion or decoction of cinchona may be also conjoined with other medicines, as the bicarbonate of potash, or soda, or ammonia, and be taken in a state of effervescence with citric acid or lemon-juice; but the carbonate should be in excess, and the warm spices or aromatic tinctures be added. In the advanced stages of this malady, and for the local lesions which supervene in the course of it, the treatment should in all respects be such as already advised in the article on diffusive inflammation of the CELLULAR TISSUE (§§ 34. *et seq.*).

519. x. PUTRID ANIMAL MATTER is productive of injurious effects when taken into the stomach; but these effects are much more serious when such matter is applied to an abraded surface, or to a wound, and more especially if it be injected into a vein.—*A.* As to the *ingestion* of this matter, Dr. CHRISTISON well observes, that "to those who are not accustomed to the use of tainted meat the mere commencement of decay is sufficient to render meat insupportable and noxious. Game only decayed enough to please the palate of the epicure has caused severe cholera in persons not accustomed to eat it in that state. The power of habit, however, in reconciling the stomach to the digestion of decayed meat is inconceivable. Some epicures, in civilized countries, prefer a slight taint even in their beef and mutton; and there are tribes of savages who eat with impunity rancid oil, putrid blubber, and stinking offal. How far putrefaction may be allowed to advance without overpowering the preservative tendency of habit, it is not easy to tell." Something, however, is due to the nature of the beverages taken along with the articles in this state, and to the powers of digestion and assimilation possessed by those who partake of such food, in enabling them to resist the injurious effects produced by it in others.

520. *B. The exhalations produced by putrid or decaying* animal matter have generally been viewed as most noxious, until Dr. BANCROFT, the apostle of modern non-infection, endeavoured to prove, in a most ponderous volume, their very harmless nature. The present state of information, and the good sense, not only of medical men, but of all competent observers, have completely disproved this absurd and injurious opinion. These exhalations are generally more or less noxious, especially when inhaled into the lungs for some time, or in certain states of predisposition to be infected by them, or in grades of considerable concentration, or when dissolved in the humidity of the atmosphere. M. MAGENDIE demonstrated that dogs confined over vessels in which animal matter was decaying, experienced similar effects to those observed in the experiments performed by him and M. GASPARD upon the introduction of putrid animal matter into the veins. These effects resembled, in every respect, the *putrid form of fever*, described in the Article FEVER (§§ 472. *et seq.*). The fact that putrid effluvia generate fever in man has been sufficiently demonstrated to require any illustration at this place, and has been sufficiently proved by evidence referred to in various parts of this work, and by proofs which have come under my own observation. The instances which have been adduced in opposition to it by Dr. BANCROFT, PARENT-DUCHATELET, and others, prove only that these exhalations are not poisonous in every case or occasion of exposure to them, and that habit and other circumstances may impart to some persons an immunity from their usual effects. These exhalations have often produced not only *putrid* or *adynamic fevers*, but also an *adynamic form of dysentery;* and in some cases, which I was lately called upon to treat, I had every reason to infer, that these exhalations may produce dysentery by their action upon the mucous surface of the anus, when resorting to such privies as contain large accumulations of fæcal matters, especially during warm seasons. An asthenic form of irritation and inflammation, with adynamic fever, was observed in these cases, the local affection extending from the margin of the anus upwards along the mucous surface of the rectum and colon; and, in three instances, affecting also the vagina and uterus in a similar manner, and with similar discharges.

521. *C.* When putrid animal matters or fluids are *inoculated* or inserted into *wounds*, or applied to *abraded surfaces*, extensive local inflammation, of a diffusive or spreading kind, with very low or adynamic fever, is developed, owing to the rapid contamination produced locally as well as in the circulating fluids, and death takes place, unless the mischief be early arrested by a very active stimulating, antiseptic and tonic treatment. The injuries received from dissection of putrid bodies, and by cooks when dressing very high game, are of this kind, they being generally attended by a diffusive cellular inflammation and adynamic fever; and are different, in both the local and the constitutional phenomena, from the injuries received in the dissection of recent bodies, although allied to them in many respects. (See CELLULAR TISSUE — *Diffusive Inflammation of.*) — Putrid animal matters occasion somewhat different effects, according to the nature of the matter, the degree of putridity, and the constitution of the individual, but these effects are more or less allied to those produced by poisons which I have viewed as septic, and classed accordingly. (See CLASS SEPTIC POISONS.)

522. *D.* The *treatment* of the effects produced by putrid animal matters received into the stomach is in every respect the same as that recommended for the poison of pork or of sausages, &c. (§§ 443. 450.). After the offending matters have been evacuated, either by encouraging vomiting, or producing it by the means just advised, *creasote* may be given with the warm spices already mentioned, and these may be mixed with powdered charcoal, or in solutions of the chlorides, and taken in doses which the urgency of the case will suggest. If dysenteric symptoms supervene, these medicines may be conjoined with ipecacuanha and opium,

or may be administered in enemata; and the rest of the treatment recommended in DYSENTERY, according to the form which the case may assume, may be adopted. I have lately given in some dysenteric cases which have been produced by putrid animal exhalations, small and repeated doses of creasote, and a weak solution of the chloride of zinc, with marked benefit. The chloride of lime may also be given in small but often repeated doses; and lime-water, with milk, or in effervescence, or Carara-water, may be used as beverages. The effects caused by the *inhalation* of putrid effluvia require similar means to those prescribed for the adynamic or putrid forms of fever. (*See Arts.* DYSENTERY and FEVER.)—The treatment of local contaminations by putrid matter is not different from that about to be recommended for *septic poisons*.

523. xi. TOBACCO. — *Indian tobacco* — *Lobelia inflata.* — *Virginian tobacco* — *Nicotiana tabacum.* — The poisonous operation of these two plants closely resemble that of each other, the latter being the most energetic.—*A.* In doses exceeding fifteen or twenty grains, the *Lobelia* causes speedy and severe vomiting, with distressing nausea, and sense of sinking at the epigastrium; sometimes purging, cold perspirations, giddiness, headach, tremors, and great relaxation and prostration of strength; failure, with intermissions of the pulse, sometimes a prickly sensation through the body to the extremities, and a smarting in passing the urine. In doses above thirty or forty grains of the powder, it produces death in a few hours, if it be not thrown off the stomach by the speedy vomiting induced by it. The most prominent symptoms are then, according to Dr. WOOD (*Lancet*, April, 1837, p. 144.), extreme prostration, great anxiety and distress; and ultimately death preceded by convulsions. Fatal effects have often resulted from the empirical use of this plant in America, owing chiefly to its not having been rejected by vomiting as is sometimes the case. The effects produced by it are the same as those now described when it is administered in an enema.

524. *B. Virginian tobacco*, in the present state of society, is one of the most important plants in nature, and one of the most deleterious poisons furnished by the vegetable creation. In whatever way tobacco is used — whether chewed, smoked, or snuffed, — habit impairs and even modifies its effects. Sir B. BRODIE found that the infusion of tobacco thrown into the rectum, paralyses the heart and causes death in a few minutes; but if the head of the animal be previously removed, and artificial respiration kept up, the heart remains longer unaffected; proving that tobacco disorders this organ through the medium of the nervous system. On herbivorous animals the effects of tobacco are less marked than on man.

525. *a.* In small doses, tobacco causes heat in the throat and warmth in the stomach; followed, especially if the dose be somewhat greater, by nausea, giddiness, and vomiting. In *larger doses*, it occasions nausea, vomiting, purging, a distressing feeling of sinking at the epigastrium, but rarely any pain. It seldom promotes sleep or evinces any narcotic influence beyond what depends upon its sedative action. In poisonous doses, its most remarkable effects are languor, feebleness, great and depressing anxiety, fainting, relaxations of the muscles, trembling of the limbs; vision and all the senses are enfeebled, the ideas confused. The pulse becomes small, weak, irregular, or intermittent; the respiration laborious; the surface and extremities cold and clammy. Recovery generally takes place if the symptoms proceed no further; but if the vomiting continue, or if the purging be frequent, the tendency to faint becomes urgent, the features sunk, the muscular powers paralysed, the pulse progressively weaker, the extremities and surface colder, and covered by cold sweats; and, ultimately, convulsive movements, general paralysis, torpor, and death take place.

526. *b.* Tobacco is used in various ways, the effects produced by it being remarkably influenced by *habit* in whatever way it may be employed, at least up to a certain amount or dose. In the form of *snuff* it acts locally chiefly. The habitual use of snuff blunts the sense of smell, and, if it be taken in excess, dyspepsia, with peculiar symptoms, and a cachectic appearance of the surface are produced by it. Dr. PROUT considers the dyspeptic symptoms caused by snuff to be peculiar and severe; and that malignant diseases of the stomach and liver are sometimes occasioned by this practice, when excessive or long continued.

527. *c. Smoking* tobacco in any way produces many of the symptoms described above if it be long continued by a person unaccustomed to it. Dr. M. HALL detailed a case which nearly terminated fatally; the subject of it having, for his first essay, smoked two pipes. Dr. CHRISTISON refers to two cases recorded by GMELIN, which were fatal; seventeen pipes in the one, and eighteen in the other having been smoked at a sitting. This practice has been adopted by some with the idea that it is a prophylactic against endemic, epidemic, and contagious diseases; but there are really no grounds for this opinion. Smoking, especially when very frequently indulged in, weakens the digestive and assimilating functions, lowers the tone of the nervous system, imparts a pale, sallow, and cachectic hue to the countenance and skin, and induces functional disorder of the stomach, liver, and bowels. The soothing and flattering visions, with which the practice of smoking feasts the weak and effeminate mind, lead to its adoption by most classes; but it is an enervating and an emasculating luxury; the offspring of those who indulge in it in excess being weak, puny, or stunted in growth; or of a nervous, susceptible, and scrofulous conformation. It often also induces a desire for spirituous liquors.

528. *d. Chewing tobacco* is even a more deleterious habit than that of snuffing or smoking. It is practised chiefly by sailors and the natives of the United States of America. In sailors, the sea-air probably counteracts its injurious influence; but when commenced in boyhood, as is often observed in this class, it stunts the growth, and in all circumstances it weakens the organic nervous energy and the mental powers, impairing also the powers of application. Persons habituated to this mode of using tobacco are irritable, restless, and miserable when deprived of it; and feel a distressing sinking at the epigastrium. If they continue long to indulge in it, they lose their healthy appearance; and, although they may not evince any severe or specific disease, the nervous system — the mental powers especially, are weakened by the habit, and they become prematurely aged and short-lived.

529. *e.* The application of tobacco to a *recent wound*, to an *abraded surface*, or to *sores*, is often attended by serious or even fatal effects. Mr. WESTON has recorded a case in which the expressed juice of tobacco was applied to the head of a boy, aged eight years, for the cure of tinea capitis. Death took place three hours and a half after the application. Three children were seized with giddiness, vomiting, and fainting, from the application of tobacco leaves to the scalp for the cure of an eruption. (*Ephemer. Cur. Nat.*, Dec. ii. Ann. iv. p. 467.)

530. *f.* Tobacco has not infrequently been employed fatally in an *enema*. I have witnessed this result from half a drachm of the infusion having been thus prescribed. An instance is adduced in the British and Foreign Medical Review (vol. xii. p. 562.), in which the decoction of twelve grains in six ounces of water, used as an enema, was fatal. Cases of a similar result from larger quantities of this plant, administered in this way, have been recorded by DESAULT, GRAHL, COOPER, BELL, and others; and it has not infrequently caused death when thus employed by empirics. The symptoms produced by it, thus administered, are similar to those already described; nausea, relaxation of the muscles, failure of the pulse, tremors, faintness, cold sweats, and excessive sinking, or fatal syncope, being the most characteristic phenomena.

531. *g. The appearances on dissection*, as described by Dr. GRAHL, are thus stated by Dr. CHRISTISON. Great lividity of the back, paleness of the lips, flexibility of the joints (two days after death), diffuse redness of the omentum, without gorging of the vessels, similar redness with gorging of vessels on both the outer and the inner coats of the intestines; in some parts of the mucous coat patches of extravasation; and unusual emptiness of the vessels of the abdomen. The stomach was natural, the lungs pale, the heart empty in all its cavities, and the brain was natural.

532. *h.* The *operation* of Virginian and Indian tobacco is nearly the same. The action of Virginian, or *common tobacco*, is similar to that of *foxglove*; but it is slightly irritant of the digestive mucous surface, and much more paralysing, causing more decided relaxation and depression of muscular power, with trembling. It, moreover, acts more decidedly upon the secretions and upon exhaling surfaces. The action of this poison differs from that of *Belladonna*, and from that of *Stramonium* or *Hyoscyamus*, in the contraction of the pupil when applied locally or taken in poisonous doses, and in the absence of any affection of the throat, and of delirium or other cerebral symptoms. The influence of tobacco differs also from that of *aconite*, in its more decided effect upon the muscular system, whilst aconite paralyses the sentient nerves, occasioning numbness and tingling, which are not observed after the administration of tobacco.

533. *i. Treatment.*—Poisoning by swallowing this plant, or preparations of it, is very rare; a few cases only being recorded. The discharge of the poison from the stomach, by the means usually resorted to, should be as speedy as possible. There is no chemical antidote to it yet known; but Dr. PEREIRA thinks that, the vegetable acids and astringents, the infusion of nut-galls, of green tea, &c., may be employed with benefit. In order to allay the vomiting and depression of vascular action, ammonia, brandy, capsicum and other spices, with small doses of opium; the cold affusion on the head if congestive or apoplectic symptoms occur; the use of strong coffee; sinapisms over the epigastrium, and the other means advised for the other poisons of this class, are chiefly deserving adoption.

534. xii. VEGETABLE ACRO-SEDATIVES OF DIFFERENT SPECIES, besides those already noticed, have produced serious effects; but their operation, and the symptoms they occasion, have not been satisfactorily observed. The chief of these are the following:—*A.* CASTOR SEEDS.—The seeds from which castor oil is extracted contain in the embryo a most active acro-sedative poison, a few of them being sufficient to produce violent purging and death. Mr. TAYLOR adduces the following illustration of their effects. A lady, aged 18, ate about twenty of these seeds, one of her sisters ate four or five, and another two. In the night of the evening on which this took place, they were all taken ill. The deceased, who had taken the largest number, felt faint and sick about five hours afterwards, and vomiting and purging came on, and continued through the night. The following morning she presented all the symptoms of malignant cholera. The skin was cold and dark-coloured; the features contracted, and the breath cold; the pulse was small and wiry; there were restlessness, thirst, pain in the abdomen; and she lay in a drowsy half conscious state. Whatever liquid was taken was immediately rejected, and the matters passed by stool consisted chiefly of a serous fluid tinged with blood. She died in five days without having rallied.—On *inspection* a very large portion of the mucous membrane of the stomach was found abraded and softened in the greater curvature. There was general vascularity of the organ, and the abraded portion presented the appearance of a granulating surface of a pale rose-colour, and was covered by a slimy mucus. The small intestines were inflamed, and their inner surface abraded. The two sisters recovered. Two or three of the seeds act as a violent depressing cathartic. The irritant poison resides in the embryo, and is not expressed with the oil, which in its fresh, or non-rancid state, is a mild purgative.

535. *B.* IATROPHA MANIHOT—*Ianipha Manihot.*—The fresh root, or the juice of this plant has been long known as a violent poison. It produces nausea, vomiting, and purging; pain, tenesmus, swelling of the body, loss of sight, coldness of the extremities, faintings, and death. Dr. BECK refers to cases in which the juice had produced these effects within an hour. The *dissection* of one case furnished no alteration, excepting that the stomach was found shrunk to half its natural size. The noxious property of this plant is destroyed by heat.

536. CLASS VI. IRRITANT AND ALTERANT POISONS. — ACRO-ALTERANT POISONS. — This class of poisons is very closely allied to the *fifth*. It comprises those substances and preparations which, either in acutely or chronically poisonous doses, not only irritate the digestive surfaces, but also alter the vital properties and manifestations of the tissues — not so much dynamically, as in the preceding classes, as in character or kind. When administered in large doses the alterative effects may not become very apparent if they produce death in a short period — if they are so given as to

prove *acutely* poisonous; but during their *slower* or more *chronic* operation, and during recovery from their acute action, the alterative effects are more fully evinced. Several of the substances comprised under this class are much employed medicinally, and have been, and even still are, prescribed, although much more rarely, so as to produce most injurious effects, owing to the alterant influence exerted by them upon the functions of several surfaces and organs, and not upon the functions merely, but even upon the organization of the structures ultimately and remotely. There are several substances which have been already considered, that produce also an *acro-alterative* effect, when administered in smaller quantities or in repeated doses. But as these, when employed as poisons or in large quantities, act either as *corrosive* poisons or as *acro-sedative* poisons — in the one case corroding or disorganising the tissues to which they are applied, and in the other depressing, or altogether annihilating nervous influence or vital power — I have thought it preferable to treat of them under these classes. Even the same poison, however virulent, does not act in a certain definite manner and specific mode, but in different ways, according to the amount, repetition, or continued exhibition of it; and to the various modifying influences already described (§ 51. *et seq.*). Poisons are not to be viewed as specific entities, producing certain and determinate results, but as powerful agents affecting nervous influence, vascular action, vital power and resistance, and even the organization of the frame, in varying modes and grades; the more manifest effects furnishing, by their prominent features especially, such characters as enable us to arrange and classify them. And thus we find that many poisons, as corrosive sublimate, the concentrated acids and alkalies, several mineral and other saline substances, and even the vegetable acrids, act as corrosive and acute poisons, and destroy life, chiefly by the intensity of their local action, when taken in sufficient quantity in certain states of the stomach, whilst the same substances, when administered in smaller or repeated doses, or in states of greater dilution, or when their exhibition has been too long continued, are fatal, or are injurious owing to different modes of action, and to their remote and secondary effects produced by different channels, their effects having a very intimate reference not only to their quantities and modes of exhibition, but also to the constitution and states of the sufferer at the time. Hence many corrosive poisons when thus, or otherwise exhibited, act as sedatives, or as irritants, or as acro-sedatives, and produce effects similar to those classed under these several heads, or act as acro-alteratives, and operate in nearly similar modes to those substances now about to be noticed.

537. i. BELLADONNA. — *Deadly Nightshade.* — *Atropa Belladonna.* — *Atropia* — has usually been classed as a narcotic, or acro-narcotic poison; but although the last stage of poisoning by it is often attended by sopor or insensibility, it is not strictly a narcotic, as will appear from the symptoms produced by it. The leaves, roots, and berries of the plant are poisonous, and produce nearly the same effects in equally powerful doses. On dogs, this plant causes dilatation of the pupil, plaintive cries, efforts to vomit, staggering, weakness of the posterior extremities, frequent pulse, a state resembling intoxication, and death (PEREIRA). I have seen dangerous, and in one instance nearly fatal effects result from the medicinal use of preparations of this plant.

538. *A.* The *symptoms* vary remarkably with the dose and the frequency of its repetition, with the mode of administering it, and the constitution of the sufferer. The most rapid appearance, and the most comatose state, of the symptoms have followed the administration of an infusion or extract of this plant in an enema. Dr. SCHARF states, that four ounces of an infusion of the root injected as a clyster produced coma and death in five hours. In a case to which I was called, the extract had been introduced into the rectum as a suppository, but the exact quantity I could not learn. Apoplectic coma soon followed, from which the patient recovered with difficulty, delirium both preceding and following the coma. The poisonous operation of belladonna is most rapidly and fatally developed, when any of the preparations of it is administered as an enema.

539. *a.* The *local* or *irritant action* of this plant is not very intense, and is exerted primarily upon the upper portion of the digestive canal, especially the fauces and œsophagus, causing dryness and redness of the throat with slight difficulty of swallowing, and but seldom vomitings or purging. In some instances soreness of the throat, difficult deglutition, and even aphthous inflammation of the fauces have been more remarkable; and in rarer cases, bloody stools, strangury, and even bloody urine have appeared consecutively, or have accompanied the nervous symptoms. The irritation of, and eruption on, the skin, characteristic of this poison, appears chiefly after a frequent or prolonged use of small doses of it. This eruption has been observed by me in several instances where I had employed belladonna. It has been likened to that of scarlatina; but it has as frequently resembled the eruption of measles. It has sometimes followed the use of the extract in ointments which I have prescribed for irritable states of the rectum, or uterus.

540. *b.* The *alterative operation* of the preparations of belladonna is varied and uncertain, and is exerted chiefly on the nervous systems, more particularly upon those portions which are most intimately connected with the manifestations of sensibility and intellect. Thus we observe dilatation of the pupils, insensibility of the irides to light, dimness of vision, diminished feeling, vertigo, staggering, delirium, and occasionally sopor, successively follow the excessive use of them. The alterative operation of this poison on others of the systems or organs of the body is problematical, although the uterine functions have been said to have been influenced by it. This plant, especially the tincture and inspissated juice or extract of it, is a valuable remedy, not merely as an anodyne, but also as an alterative in several diseases; but, if exhibited without due caution, especially in children, or in hooping-cough, it is liable to be followed by injurious or even dangerous effects. Accidents from this poison most frequently are observed in children, who sometimes eat the berries.

541. The husks and seeds of the berries are very indigestible, and may remain long in the stomach or bowels, whether the case recover or

prove fatal, especially if free vomiting has not been early procured. In one case the seeds were vomited towards the close of the third day. (*Med. Obs. and Inq.* v. vi. p. 224.) In another case, the black husks appeared in the stools after the use of laxatives on the second day. In several other cases adduced by M. BOUCHER, fragments of the fruit were vomited on the second day, and passed by stool on the third, although actively treated from the commencement. But this can occur only when the fruit has been taken accidentally or by mistake; but all cases of poisoning by belladonna are not of this kind. Even the administration of preparations of this plant for medicinal purposes may be such as to occasion either dangerous or fatal effects, especially in children; and the juices of it may be given with felonious intentions. They have been so employed, either mixed in wine, or in other fluids, in the commission of murder; and even to aid the commission of thefts or robberies; decoctions and infusions of various parts of the plant having likewise been used for the same purposes, as recorded in numerous works of the preceding two centuries. Dr. CHRISTISON remarks that other species of *atropa* are probably similar in their properties to belladonna. WILMER quotes instances of frantic delirium having occurred among shepherds as well as their cattle from eating the *atropa mandragora*, which was used by the ancients in medicine.

542. *B. Atropia*, the active principle of this plant, is not likely to be employed as a poison. Given to the lower animals it produced the same symptoms as the berries or the leaves. One tenth of a grain caused in the human subject dryness of the mouth, constriction of the throat, difficulty of swallowing, dilatation of the pupil, headach, and stupor.

543. *C. Diagnosis.*—Whatever part or preparation of this plant may have been taken into the stomach, or otherwise administered, *dilatation* of the pupil is always observed, if the dose is poisonous. This symptom precedes the *delirium*, the character of which is peculiar and *diagnostic*, especially when viewed in connection with the state of the pupil, and the dryness, soreness, or constriction of the throat. The delirium is generally gay, extravagant, pleasing, talkative, more rarely furious. It is sometimes attended by uncontrollable laughter, and occasionally by loss of voice. Vision is obscure, the iris is insensible to light, and the eyeball sometimes red and prominent. A state resembling somnambulism has in rare cases been observed. The sopor or lethargy produced in the more severe cases, generally does not appear for a considerable time after the poison has been taken. *Giddiness* first occurs, and is followed by the delirium, which may continue for several hours before *sopor* takes place; but, in some instances, the sopor has occurred more early, and has been followed by delirium. Occasionally, even in the same case, the delirium, which preceded the stupor, returns when the stupor goes off; *and very frequently the stupor is not distinct at any stage*, showing that this poison should not be classed with narcotics. *Convulsions* are not frequently produced by it, unless in children; in adults they are slight, or confined to the muscles of the face; but *subsultus tendinum*, or catching of the extremities are frequent. The periods at which the symptoms appear vary much. Giddiness may appear in a few minutes, or not until two or three hours, and the affection of the eyes about the same time, or soon afterwards. The delirium may be delayed for some hours. These symptoms may continue for two or three days. They generally persist much longer than in cases of narcotic poisoning. In some instances these symptoms, especially the blindness and state of the pupil, giddiness, tremors and other nervous affections continue for several days, or even weeks.

544. *D.* The *appearances after death* have not been observed in many instances. In a case described by GMELIN, the subject of it died twelve hours after eating the berries. The body was examined twelve hours after death, and yet putrefaction had commenced, so that the abdomen was swollen, the scrotum and penis distended with fœtid serum, the skin covered with dark vesicles, and the brain soft. The blood vessels of the head were gorged, and the blood every where fluid, and flowing profusely from the mouth, nose, and eyes. M. ROQUES describes somewhat similar changes to the above, and states them to be usually found after poisoning by this plant, especially the swelling of the abdomen, livid spots on the surface, exudations of blood or of a bloody froth from the mucous canals, especially the mouth and nostrils, and sudden and rapid putrefaction, preceded by general intumescence of the body. When the berries, husks, or seeds have not been vomited or passed by stool, they are sometimes found in the alimentary canal, and furnish evidence of the nature of the case; when they have been evacuated and are detected in the discharges, they assist the diagnosis, which is seldom difficult when any part of this plant has been eaten accidentally, or otherwise administered. — (See M. ROQUES, *Phytographie Médicale*, t. i. p. 229. *et seq.*)

545. *E. Treatment.*—The speedy and complete evacuation of the poison from the stomach, by means of an emetic of zinc, to which capsicum may be added in order to arouse the paralysed organ, should be first attempted, especially when the fruit has been eaten. In these cases the stomach-pump ought not to be confided in alone, although it may be required in aid of the emetic, the free operation of which should be duly promoted. The older writers strongly advised recourse to vinegar, and either it, or other vegetable acids, will prove serviceable after the poison has been evacuated. The cold effusion on the head and neck is indicated for the removal of the delirium or sopor; but it should not be continued too long at a time. In some cases, tepid affusion may be substituted for the cold. Dr. PEREIRA suggests the administration of nut-galls or green-tea. I found full doses of camphor and chloric æther successful in a case in which the inspissated juice administered by the rectum proved nearly fatal, tepid affusions having been also administered.

546. ii. CANTHARIDES — *Cantharis Vesicatoria — the Blister Beetle or Spanish Fly,* — *Cantharidin — Vesicatorin.* — Cantharides may be poisonous in any of the forms in which they are employed in medicine, — in that of powder, or of tincture, of vinegar, of cerate, ointment, or plaster. Applied *topically* they excite the nerves of the part, and irritate and inflame the capillaries, occasioning first a sense of heat, followed by pain, redness, and slight swelling. They are readily absorbed into

the circulation — or their active principle — *Cantharidin* — and, in addition to their local action, they produce very energetic effects upon the vascular and nervous systems, especially on the spinal cord, and upon the urino-genital organs.— *A.* Their *local action* is irritant and inflammatory; their *remote operation* is alterative, exciting, irritating and inflaming, according to the amount and repetitions of the dose; their *primary* influence being exerted on the nervous systems, their *secondary* or consecutive operation being produced chiefly through the medium of the blood. They are eliminated by the kidneys, on which and on the urinary bladder and passages they produce the effects just described. They are thus closely allied in action to several substances comprised under the class of acrid and corrosive poisons, on the one hand, and to many of those belonging to the excitant and irritating classes, on the other. The local action of cantharides is nearly the same wherever they are applied; and their remote effects are also the same whether they are taken into the stomach, or applied to the skin, denuded of its cuticle, or to a wound, or thrown into a vein. They have destroyed life, when taken as an aphrodisiac, or to produce abortion, or accidentally. They are very rarely employed to produce murder or suicide.

547. *B. Symptoms.*—*a.* These vary with the mode of exhibiting this poison, and the quantity of it administered. When it is taken in large or repeated doses, or to an amount sufficient to produce a *sub-acute form* of poisoning, heat and pain in the throat, stomach, and intestines, are experienced. To these are soon added thirst and pain in the loins, extending along the ureters to the bladder, with a burning sensation in this viscus, a frequent desire to evacuate the urine, which is passed frequently, in small quantity, with difficulty, and sometimes more or less tinged with blood. The pulse is frequent and hard, the skin hot, and the respiration quickened. The nervous system is somewhat excited; painful priapism, with or without satyriasis, being also present. In still larger quantity, the effects are more *acute.* A violent burning is felt in the throat, gullet, and stomach, with pain and tenderness in the epigastrium, extending over the abdomen, with sickness and vomitings. To these are added extreme thirst, and pain in the loins and bladder; dryness and heat of the mouth, sometimes with fœtor or with ptyalism; and incessant desire to void urine, the attempts to evacuate it being attended by excruciating pain, and nothing but drops of blood or of bloody urine being passed; and excessive tenderness of the whole abdomen. The heat and constriction of the throat increase, and are attended by distressing difficulty of deglutition. Violent griping pains of the bowels, with purging or with tenesmus, bloody stools, &c. are generally experienced. The difficulty of deglutition is often accompanied with a dread of fluids, although the thirst is urgent; and the matters vomited consist chiefly of mucus or flakes of lymph streaked with blood. The priapism is painful and constant, the genital organs being swollen and inflamed. In some instances maniacal delirium, tetanic convulsions, and coma supervene and terminate life; in others the delirium is less marked; giddiness, faintings, sinking of the pulse and vital powers, and other symptoms of gangrene consequent upon acute inflammation being present. *Death* is more immediately produced either by the inflammation and consequent gangrene of the alimentary canal, or of the genital and urinary organs, or partially of both; or, if the patient live somewhat longer, by the intensity of the nervous symptoms.

548. *b.* The *duration* of the symptoms depends upon the susceptibility of the individual to the action of cantharides, upon the preparation of it administered, and upon the treatment. The tincture is followed by a more immediate effect than the powder. Even in fatal cases, death seldom takes place before three or four days, and it may not occur until after two or three weeks, — from the consequence of the inflammation produced in the alimentary canal, or in the urinary passages, or even in the brain, or spinal cord or their membranes. Sometimes the nervous symptoms do not appear until several days after the ingestion of the poison. The *quantity* which may be considered sufficient to destroy life depends upon the nature and strength of the preparation. ORFILA has seen twenty-four grains of the powder prove fatal; but as abortion was first produced, it is probable, that this circumstance not only accelerated but also aided this result, which occurred on the fourth day. The smallest quantity of the tincture which has caused death is one ounce, the individual having lived fourteen days. But, whilst smaller quantities may occasion dangerous or even fatal results, much larger may fail of producing very serious effects, the circumstances so frequently referred to remarkably affecting the issue. Instances have occurred of *blistering plaster* having been swallowed by mistake. In one case, half an ounce of the plaster, containing two drachms of the powder, was taken, and death occurred in twenty-four hours (*Edin. Med. and Surg. Journ.*, Oct. 1844), the shortest period in which cantharides have been fatal.

549. *c.* The application of cantharides to the skin, as a *vesicant*, or external irritant, being very generally adopted, is in many cases productive of fatal consequences; owing to the severity of the local alterations, to the intensity of the inflammation and sphacelation they sometimes occasion, and to the spreading of these effects; and, more rarely, to their influence upon the urinary organs and nervous system. The mischief thus produced occurs chiefly in infants or young children, of a cachectic habit of body, or in those with either a deficiency or an exuberance of blood; or when the application is too long continued, or is followed by injudicious topical dressings. It is most likely to occur when the blister is applied on children infected with the more adynamic or malignant forms of the exanthemata, especially measles and scarlet fever, and is allowed to remain too long upon the part, or after redness is produced. The admission of the air to the denuded surface, and the application of rancid ointments as dressings, are also often concerned in producing these serious local effects.

550. *C. Appearances on Dissection.*—In the acute cases, and when death has taken place after a few days, the mouth, œsophagus, stomach, and small and large intestines, as well as the kidneys, ureters, bladder and genital organs, have been found inflamed: and, even in rare instances, sphacelated in parts. In an instance where an ounce of the tinc-

ture had been taken, and death did not occur until the fourteenth day, the villous coat of the stomach was not inflamed, but it was pulpy and easily detached; but the kidneys were inflamed. In the most rapidly fatal cases, the powder may be detected adhering to the villous coat of the stomach. In more prolonged cases, congestion or increased vascularity of the brain, cerebellum, spinal cord, and their membranes, have been observed. Ulceration of the bladder in some instances, and even sphacelation of the genitals, have been mentioned.

551. *D. Treatment.*—Cantharides are productive of severe irritation passing into acute or sub-acute inflammation, according to the quantity administered; and their absorption is followed by inflammation of the urinary organs, and by excitement, and sometimes by inflammatory irritation of the nervous centres. The indications of treatment are hence obviously — 1st. To remove the poison by emetics, and by encouraging vomiting; and, 2d. To allay the inflammatory action in these parts. When the sufferer is seen sufficiently early, and vomiting has not commenced, ipecacuanha should be given in copious emollient and demulcent draughts, and its operation promoted by tickling the fauces, by the tepid infusion of chamomile, &c. The inflammatory symptoms require general and local bloodletting; but if there be reason to infer that any of the poison still remains on the stomach, the discharge of it should be procured or attempted previously to resorting to depletions, lest absorption be promoted. When bloodletting is prescribed, it should be employed in a decided manner, and aided by demulcents containing small or moderate doses of camphor and nitre, with opium, henbane, &c. Emollient injections into the large bowels and into the bladder, and warm baths, hip-baths, fomentations, &c., are always beneficial. Oil was once supposed to have been an antidote to cantharides; but there is no known antidote to this poison; and oil is now ascertained rather to aggravate than to alleviate the symptoms, by dissolving the active principle of cantharides.

552. Poisoning by the external application of cantharides requires the same treatment as now advised. In these cases, the urinary organs are generally more affected than the digestive canal, and diluents, demulcents, opium with camphor, are chiefly required, unless in the more severe cases, when bloodletting is necessary. But these cases generally soon recover, unless the poison be applied to a very large surface or to a recent wound; and in these the protection of the surface from the air and full doses of opium are requisite. During recovery the digestive and urinary organs long remain irritable, and the nervous system susceptible, therefore a bland farinaceous or vegetable *diet* should be adopted, and continued for some considerable time, and flannel worn nearest the skin.

553. iii. CHLORINE AND THE CHLORIDES. — *A. Chlorine gas* produces violent spasm of the glottis if it be *inspired* in a pure state.—*a.* Mixed with air it causes a sense of tightness of the chest, of suffocation and violent cough, owing to the irritation of the bronchi and spasm produced by it—a state of artificial asthma. This effect, if not excessive, generally passes off with increased mucous expectoration. When much more diluted with air, it occasions a sensation of warmth in the chest, and promotes expectoration. As a principal fumigating and disinfecting agent, it is liable to produce injurious effects, when air too strongly impregnated with it is breathed; but it is chiefly in manufactories that it is most likely to be hurtful, although the irritating effects of chlorine are less powerful on those accustomed to inhale it. Dr. CHRISTISON was told by a chemical manufacturer in Belfast, that his workmen can work with impunity in an atmosphere of chlorine, where he himself cannot remain above a few minutes. The chief effects produced by inhaling this gas by the workmen are more or less emaciation from the absorption of fat, acidity and disorder of stomach, which are usually corrected by chalk.

554. *b.* When diluted with air, or aqueous vapour of 116° F., and applied to *the external surface*, it produces peculiar sensations similar to the stinging of insects, accompanied with copious perspiration and determination of blood to the skin, and sometimes followed by an eruption of minute papulæ. In a pure form, its action on the skin is similar, but more energetic. A repeated or prolonged application of the gas to the skin is followed by soreness of the gums and mouth, or fauces, occasionally by slight ulceration, and generally by a more abundant as well as altered state of the salivary and biliary secretions. Mr. WALLACE believed that it tranquillizes whilst it excites nervous power; and Professor ALBERS, that it is stimulating locally, and antiphlogistic remotely. Many years ago I examined its operation with Mr. WALLACE in London (in 1823), and subsequently in Dublin (in 1834), and inferred that it is *locally* irritant or stimulating, according to the amount of dilution, and *remotely* alterative, as regarded nervous power and glandular action. Whether inhaled or applied to the external surface, it is absorbed as shown, and ascertained by Mr. WALLACE and myself, by the state of the urine.

555. *c. Treatment.* — It is chiefly owing to its accidental inhalation in too strong a state of dilution that injurious effects have arisen from this gas. The inhalation of the vapour of warm water, of the spirit of wine, or of æther, has been recommended for the removal of the effects of chlorine; but Dr. PEREIRA states, that he has tried these when suffering himself without the least benefit. In a case related by KASTNER, sulphuretted hydrogen was said to have afforded great relief; but this agent should be used with great caution, as it is itself a powerful poison.

556. *B. Chlorate of Potash* was supposed to be an active stimulant and antiseptic, and, in large doses, an irritant poison. I have frequently employed it, since 1816, both in public and private practice, especially in the more malignant states of disease, as an antiseptic, disinfectant, and tonic; but I have been much disappointed in its effects, which I have not found such as I expected, or by any means certain. It, however, diminishes the fœtor of the excretions, even those from the skin, as evinced in the putrid and adynamic states of fever, and it is absorbed into the circulation, from which it is excreted chiefly by the kidneys; and it may be detected unchanged in the urine. I have employed it in large doses without obtaining other effects than nausea and vomiting. It appears to be locally irritant, and remotely alterative and diuretic.

557. *C. The chlorides and the hypochlorides of*

soda and lime produce effects much resembling those caused by chlorine; but these vary remarkably with the degrees of dilution. In concentrated states they are caustic and irritant; in states of dilution, irritant or stimulant, antiseptic and alterative. I employed these substances largely in practice, especially public practice, and when they were first discovered, and found them useful in dysentery and malignant forms of disease; the secretions and excretions in which they remarkably corrected and improved, whilst they appeared, particularly when aided by appropriate medicines, to support the powers of life. I am, however, unacquainted with injury from the administration of them. When taken in excessive doses they are most likely to occasion gastro-enteric irritation, for which albuminous fluids, the whites of eggs, milk, and oleaginous or mucilaginous diluents are the most suitable remedies. If these salts have been taken in very large quantity, emetics, or the stomach-pump may be required; and, after they have been evacuated by these means, these fluids should be abundantly exhibited. Acids must be avoided, lest they should disengage chlorinic gas in the stomach (PEREIRA).

558. iv. IODINE, THE COMPOUNDS OF. — The *corrosive* action of pure iodine, and of strong solutions, or rather tinctures of it, has been already considered (§§ 179. *et seq.*). It remains only to notice the locally irritant and remotely alterative injurious effects of the compounds of this substance, or of small doses of it, when either too long employed, or given in such forms as produce *slow* or *chronic poisoning*. The preparations most likely to produce these effects are, the *tinctures* and the *iodides*, as the iodide of potassium, or the iodureted iodide, the iodide of sulphur, and the iodide of iron. In some constitutions, any of the preparations of iodine occasion, even before a few doses of either are taken, and although the doses are very small, remarkably depressing effects, and generally without any signs of local irritation. I have met with several instances of this very unusual and severe effect of these preparations, in practice, and in three of these, the preparations of colchicum were also injurious in very small doses. In general, iodine is not hurtful unless the dose is considerable, or be repeated too frequently, or its use too long continued.—*a.* The *irritating operation* of iodine is most readily manifested by irritable temperaments, and dyspeptic persons. In these, and in other persons in larger doses, it occasions nausea, loss of appetite, cardialgia or heat of stomach, subsequently colicky pains, relaxation of the bowels, diarrhœa, salivation, diuresis, &c. If this substance, or any of its compounds, be still administered, these effects go on increasing, and are attended by soreness of the mouth, severe colic with diarrhœa, emaciation, rapid absorption of the fat surrounding the mammary glands in females; headach, vertigo, sometimes drowsiness or stupor. When iodine is taken in smaller doses, so as not to cause injurious irritation, it acts as a tonic and alterative, and improves both the strength and flesh. But, if too long persisted in, several of the above effects afterwards appear.

559. *b.* In *larger or more frequently repeated doses*, the effects are more severe, and amount to what have been designated *iodism*. These are generally severe vomiting and purging, colicky pains, thirst, and fever; a frequent, small pulse, sometimes a dry cough; cramps of the extremities; rapid emaciation, with occasionally a darker hue of the skin and hair, especially if the iodine has been taken for a long period. In some instances wasting of the mammæ or testes; and most of the symptoms of chronic gastro-enteritis. It is rare, however, to meet with instances of these effects from iodine, unless it have been given in a most imprudent manner, or too long persisted in, and even then something should be imputed to idiosyncrasy.

560. *c. In still larger doses* the symptoms either approach, or are identical with, those attending the corrosive form of poisoning by iodine (§ 182.). When iodinic preparations have either been long continued, or often repeated, especially in large doses, so as to produce not merely an irritant operation but also a constitutional change — a marked alterative effect, various contingent phenomena, of a more or less severe character, referable either to the nervous system or to the heart and lungs, are apt to appear, especially stupor, tremors, vertigo, faintness, irregularity of the pulse, alarming sinking, shortness of breathing, restlessness, and even death. In these cases the system may be viewed as saturated with the iodine, notwithstanding that the kidneys have been eliminating it from the circulation, as proved by its presence in considerable quantity in the urine; for it has been detected in the viscera and tissues in such circumstances, and even several days after the administration of iodine had been relinquished. The *appearances in fatal cases* have been already described (§ 183.).

561. *d.* The *treatment* of the more *chronic* or *acro-alterative* form of poisoning by any of the preparations of iodine, consists in the removal of gastro-enteric irritation by local depletions and counter-irritation. Demulcent and mucilaginous substances should be given with the preparations of opium or of poppy; and starch or emollient enemata, with syrup of poppies or the tinctura opii composita, should be thrown up from time to time. Warm baths are generally useful. The diet should be chiefly farinaceous or amylaceous, with or without milk; and during convalescence, the regimen and diet recommended for *gastro-enteritis* and the more inflammatory states of *indigestion* ought to be adopted.

562. v. MERCURY, THE PREPARATIONS OF. — The poisonous operation of the *bi-chloride* has been already considered (§ 215.). But life may be destroyed or put in jeopardy by an excessive or prolonged recourse to any of the preparations of this metal.—*A. Fluid mercury* is inert when swallowed as long as it retains its pure metallic state; but it may be slightly oxidized in the alimentary canal, and thus acquire activity, especially if it be long retained in the bowels. Many years ago it was the fashion to swallow fluid mercury, and, more recently, large quantities of it were often given in order to remove obstructions. It rarely, however, produced unpleasant effects from having become oxidised. ZWINGER states, that four ounces occasioned profuse salivation four days after swallowing it; and LABORDE records the case of a man who retained seven ounces for fourteen days, and was attacked with profuse salivation, ulceration of the mouth, and paralysis of the extremities. I was lately called to a man who had taken, some time previously, seven pounds' weight of fluid mercury with a suicidal intention. His medical attendant informed me that it produced a

painful sense of weight and constriction in the abdomen, the body having been bent forwards; but it caused no further disorder, and continued to pass off at intervals for some days.

563. It was not unusual, during the last and preceding centuries, to wear belts with fluid mercury around the body for months, or even years; but the practice was not always devoid of harm; for, in some cases, profuse salivation, and other specific effects of this metal appeared either suddenly or with great severity.

564. *B.* The injurious effects of *mercurial vapours* have been shown in the article on ARTS AND EMPLOYMENTS, *as causing disease* (§§ 24. *et seq.*); and the *tremor mercurialis*, with the several cachectic and cerebral symptoms associated with it, is there described. This form of *shaking palsy*, — *tremblement mercuriel* — is chiefly met with in workmen whose employments subject them to mercurial vapours. If the emanations still continue to operate, in any circumstance of their evolution, various cachectic symptoms, vertigo, loss of memory, imperfect and unsteady action of the muscles, slight atonic convulsions, and even delirium, epilepsy or apoplexy, terminating in death, are the not infrequent results. Salivation, ulceration of the mouth and gums, hæmorrhages, and emaciation, are frequently also produced by mercurial vapours. In 1810, the Triumph Man-of-War, and a small vessel, received on board several tons of quicksilver at Cadiz. Owing to the rotting of the bags the mercury escaped, and the whole of the crews became more or less affected. In the course of three weeks 200 men were salivated, and two died. All the lower animals in the vessels — cats, dogs, sheep, fowls, rats, mice, and cock-roaches, were destroyed.

565. *C. The mercurial compounds* are all injurious, not excepting even the sulphurets, when taken in excessive quantities, or when their use, even in small doses, is very long continued.—*a.* The *local action* of mercurials is irritant and alterant; but the bi-chloride and nitrates, in states of more or less concentration, pass beyond this state of action, and are, as shown above (§§ 215. *et seq.*), caustic and corrosive, although when very much diluted, they, as well as the chlorides, diminish both irritation and vascularity in the surfaces to which they are applied.

566. *b. The consecutive and remote* operation of mercurials vary with the preparation and the modes of employing it. When taken internally in *small doses*, they promote all the abdominal secretions and excretions, especially the biliary and pancreatic secretions. If the doses be *repeated*, these effects are not only increased, but others are also added; the mucous surfaces and skin manifest an augmented exhalation, the gums become red and tender, the urinary secretion is increased, and the catamenia promoted; absorption proceeds more rapidly, the pulse becomes somewhat accelerated, and the strength slightly impaired. The repetition or number of the doses, as well as the amount of each required to produce these changes, vary with the constitution and idiosyncrasy of the individual, and the amount of action upon the bowels. If the mercurial be continued longer, or after these effects commence, or if the doses be larger than are necessary to produce them, the redness and tenderness of the gums pass into swelling, the tongue, which was at first broad and soft at its edges, becomes flabby and swollen; a coppery taste is perceived in the mouth, which, with the gums, is sore and tender; *salivation* more or less profuse supervenes; the salivary glands are tender and swollen, the teeth are loosened, the breath betrays a peculiar odour and fœtidity; the pulse is now more accelerated, the strength much impaired, and emaciation more rapid as the salivation proceeds and increases; the quantity of saliva discharged sometimes amounting to several pints in the twenty-four hours. Such may be said to be *the first stage* of chronic poisoning by mercurials, as frequently produced formerly for the purpose of curing certain diseases, especially the venereal disease; but now very rarely required either for this or any other distemper. During salivation, the urine, according to Dr. PEREIRA, does not contain a trace of albumen. The mercurial action alters the secretion of the salivary glands, and causes it to approach more nearly the fluids exhaled from inflamed serous membranes.

567. *D.* The *first stage* of poisoning by mercurials is generally such as now described; but occasionally other and more serious phenomena appear, after a more or less liberal recourse to any of them, and *assume the features of distinct maladies*. An acquaintance with these contingent effects of the constitutional action of mercurials is of great importance to the practitioner. They are not so much owing in most instances to the preparation employed as to the idiosyncrasy, or the state of health of the individual; a scrofulous constitution, the venereal taint, and other causes favouring their occurrence, The maladies which may be ranked under the first stage of chronic poisoning by mercury are, *first*, what has been called *mercurial disease* — *Morbus mercurialis, hydrargyrosis, cachexia mercurialis, &c.*, and which presents various *forms* or *states*; — and *second*, what has been named *pseudo-syphilis*, or *cachexia syphiloidea*, or what is supposed to be syphilis modified by the mercurial disease.

568. 1st. *Mercurial disease* may be viewed as the generic appellation of several morbid conditions resulting from mercurial preparations — from a few grains only of blue pill or of calomel in some constitutions, or from large and repeated doses of these or of other compounds of the metal in others. — (*a.*) *Excessive salivation* — *Ptyalismus mercurialis* — *Stomatitis mercurialis* — may occur from a small dose of any mercurial, or from large or excessive doses. It is oftenest met with after small or moderate doses, and is then the result of peculiarity of constitution. The mouth rapidly becomes violently affected; the tongue is swollen so that it hangs out of the mouth, and prevents the patient from speaking and eating; the gums are tumefied and ulcerated, ulceration often extending to the cheeks; the teeth are loosened or drop out, owing to the sloughing of the gums; the salivary glands are enlarged, tender, painful, and the surrounding cellular tissue congested or infiltrated; and the quantity of salivary discharge remarkably increased, sometimes ten or twelve pounds being secreted in the twenty-four hours. With the progress of these symptoms debility and emaciation make rapid progress; and, with sloughing of the gums, caries of the alveolar process not infrequently takes place. If the mercury be continued, involuntary movements of the muscles, or states of incomplete palsy may appear, and the

patient sink from extreme vital depression. Even when the mercury is relinquished, the inordinate salivation and other symptoms may still continue, and be arrested with the greatest difficulty. Indeed such is the case whenever this effect follows the use of a small dose of mercury, and depends upon idiosyncrasy. In some intances, the ulceration and sloughing are followed by contraction of the arches of the palate, and by inability to open the mouth sufficiently. Occasionally the salivary glands become remarkably enlarged, tender, and inflamed, and the surrounding parts swollen (*Parotitis mercurialis*), and the mouth ulcerated, before the salivation commences, the salivary discharge relieving the extreme swelling and pain of the glands; but this most frequently occurs when the patient has been exposed to currents of cold air or to cold and humidity upon the accession of the mercurial action.

569. (*b.*) *Mercurial Purging.* — *Diarrhœa Mercurialis.*—Excessive purging occurs sometimes after a moderate dose of a mercurial; and may arise from an excessive accumulation of bile in the gall-bladder and ducts having been suddenly let loose, in which case the evacuations are greenish or dark; or from an excessive secretion of the pancreatic fluid having been produced, and then the evacuations are pale, watery, frothy, or ropy, and are attended by pain, heat, or tenderness in the region of the pancreas. (See PANCREAS, *diseases of.*) Excessive diarrhœa after mercury has been ascribed by DIETERICH (*Die Merkurialkrankheit*, Leipz. 1837) to a species of pancreatic salivation caused by mercury, and called by him *ptyalismus pancreaticus mercurialis*, or *ptyalismus abdominalis, diarrhœa salivalis, &c.*

570. (*c.*) *Mercurial Fever* — *Febris Mercurialis* — *F. Salivosa*—is generally caused by the excessive use, or by very large doses of mercury, and seldom appears until after some days. It is attended by dryness of the mouth, redness and swelling of the gums and tongue, great acceleration of pulse, with restlessness, headach, hot and dry skin; swelling or tenderness of the parotids, sometimes extreme, as already noticed (*Parotitis Mercurialis*), and loss of appetite and nausea. This state of irritative fever generally terminates with a profuse salivation, more rarely with purging or sweating, or with some form of cutaneous eruption (§ 574.).

571. (*d.*) *Mercurial Cachexy.* — *Cachexia Mercurialis* is a more frequent consequence of the prolonged use of mercury, and even of the repeated exhibition of calomel, than is generally supposed; and as far as my own observation extends, it constitutes, in various modifications, the most frequent form of slow poisoning by mercury. It is not infrequently produced by prolonged efforts to effect the salivary glands in the treatment of hepatic or other diseases, and is *characterised* by the usual symptoms of irritative fever, without flushings, but with great pallor, emaciation, and manifest anæmia. There are, also, loss of appetite, depression of spirits, disordered bowels, with offensive stools; and occasionally swelling of the salivary glands, redness or sponginess of the gums or ulcerations of them and of the mouth, cheeks, &c., but rarely any salivation. It usually passes almost insensibly into tubercular phthisis.

572. (*e.*) *Mercurial erethism.* — *Erethismus Mercurialis.* This alarming affection, thus denominated by Mr. PEARSON, has been viewed by DIETERICH as adynamic mercurial fever — *Febris mercurialis adynamica.* — Since Dr. DIETERICH wrote, one case of it has come under my observation; and my examination of that case, as well as my recollection of former cases, has not furnished evidence of the accuracy of this view. The *symptoms* of this affection are, rapid depression of strength with a sense of sinking and anxiety, referred chiefly to the præcordia; with partial or general tremor, frequent sighing, universal sense of coldness, and diminished temperature of the surface. The pulse is small, quick, and weak; the countenance is pale, collapsed, and expressive of anxiety and alarm. Vomiting sometimes supervenes, and favours reaction and recovery. In the case just alluded to I could detect nothing, by the aid of the stethoscope, beyond absence of the impulse of the heart, and very weak, frequent and occasionally irregular contraction. A fatal termination has followed muscular exertion. This affection appears to consist of extreme depression of vital power, and of muscular irritability, manifested chiefly by the heart, and of congestion of the lungs; and hence it might be more appropriately called *Asphyxia cardiaca mercurialis.*

573. (*f.*) *Neuroses Mercuriales.*—Various *nervous* and *mental disorders* are sometimes produced by mercury, especially when any of its preparations have been long persisted in, owing to the depressing and alterative action on the nervous systems, probably aided also by other influences. *Melancholia*, sometimes attended by delusions, and various states of partial insanity, in which fears of impending or future calamities more or less predominate, and even sway not only the feelings and sentiments, but also the volitions and actions, are not infrequently produced by a frequent recourse to mercurial preparations. Tremors or tremblings (*tremor mercurialis*), sometimes passing into palsy (*paralysis mercurialis*), hyponchondriasis, &c., are also not infrequently occasioned by this cause; and are duly considered at other places.

574. (*g.*) *Various affections* of the external surface and of other parts of the body are sometimes produced by an excessive use of mercury; yet it is extremely probable that they are not owing to this cause alone, but to peculiarity of constitution, or to some pre-existing taint or local vice. — *Certain acute* and *chronic eruptions on the skin* sometimes appear as the effects of mercury; but are now more rarely met with since severe courses of this mineral have been much less frequently resorted to. — *Eczema Mercuriale.* — *Erythema Mercuriale.* — *Lepra Mercurialis.* — *Erysipelas mercurialis* — *Hydrargyria* — are the names which have been given to an acute eruption which has sometimes appeared during a severe mercurial course, and been attended by considerable danger. This affection has been described by PEARSON, ALLEY, MORIARTY, STOKES, SPENS, CULLERIER, LAGNEAU, RAYER, and others. It generally consists of innumerable minute pellucid vesicles, which give a diffused red appearance to the skin, and a sensation of roughness to the touch: it is generally preceded and attended by more or less febrile disturbance. In two or three days the vesicles attain the size of pin's heads, and the contained serum becomes opaque and milky. The eruption soon extends over the body, and is accompanied by swelling, tenderness, and itching.

It usually terminates by disquamation; but a copious discharge sometimes takes place from the excoriated surface; and, with the epidermis, forms large flakes. In some instances the hair and nails fall off, and the eyebrows become denuded (PEREIRA). There also is more or less internal disorder, especially tightness and oppression in the chest, dry cough, with indications of congestion of the lungs and bronchial irritation. ALLEY saw forty-three cases of this eruption in the first ten years of this century, and of this number eight were fatal; more recently RAYER met with only three cases; and PEREIRA only with two. I have seen only two cases, and these occurred at an early period of my practice. Other cutaneous eruptions have been said to be sometimes caused by mercury, especially a *miliary eruption, Herpes, Impetigo, Psydracia*, &c.; but this origin is doubtful, and most probably other causes concur, if not entirely produce them.

575. *h.* Congestions and inflammations of various parts, especially of the eyes, or certain tissues of the eye, as the iris, the retina, the conjunctiva, &c.; congestions and inflammations of the periosteum, (*mercurial periostitis*) and caries of the bones, especially of the more spongy bones; and similar diseases of the pericranium, bones of the cranium and dura mater, have also been ascribed to mercury; but are often owing more to a venereal taint, to the scrofulous diathesis, or to idiosyncrasy, than to this mineral; although exposure to cold and vicissitudes of temperature and weather in a cold or variable climate sometimes produce those diseases, which assume a peculiar character during the mercurial saturation and action, especially when aided by the constitutional taints just alluded to.

576. 2nd. In this way also may be explained the several morbid conditions which are comprised under the denomination of *Cachexia syphiloidea—Pseudo-syphilis.* The modes, also, of employing mercury in the cure of venereal or other maladies, and the various grades or states of saturation of the system, which these modes induce, may have some influence in producing various affections of a peculiar or anomalous character; for it may be anticipated that the large doses of calomel, given in a warm climate, will affect the constitution much less, and somewhat differently from, the large inunctions of mercurial ointments, sometimes more or less altered by long keeping, so often employed in this and other cold climates, especially in former times; and that even the blue-pill may be so changed by keeping, particularly in hot and humid countries, as to act differently from the recent preparation.

577. *E. Acute Poisoning* by excessive or large doses of mercurial compounds — by single or repeated doses — is generally attended by symptoms of acute gastro-enteritis; but these, as well as the more remote effects, vary with the preparation administered. In general they are altogether the same as are described when treating of the *corrosive operation of the salts of mercury* (§§ 216—228.), or differ merely in severity, and as respects the liability to any of the consecutive effects just described.

578. *F. Intolerance of Mercury.* — The injurious effects now described are usually produced by a prolonged or an excessive use of any of the preparations of mercury, excepting probably the sulphurets; but in some constitutions very small doses may occasion excessive salivation and some of the other slighter effects, and even a single small dose may have the same result. When salivation follows a single dose it usually appears on the second or third day, and rarely sooner, but occasionally later. It may, however, appear much sooner, and with great severity, considering the dose, when the preparation, as calomel, is allowed to remain in the mouth for some time. In an instance mentioned by Dr. BRIGHT, five grains of calomel put on the tongue in apoplexy, and not washed down, excited in three hours most violent salivation. Dr. RAMSBOTHAM states, that fifteen grains of blue-pill, taken in three doses, one each night, produced fatal salivation (*Med. Gaz.* i. 75.). Dr. CRAMPTON records a case where two grains of calomel caused ptyalism, extensive ulceration of the throat, exfoliation of the lower jaw, and death. (*Trans. of Dub. Col. of Phys.*, iv. 91.) Dr. CHRISTISON says that three drachms of mercurial ointment applied externally caused violent ptyalism and death in eight days. (*Op. Cit.* p. 379.) I have seen one grain of the bichloride divided into twenty doses, of which one was to be taken thrice daily, produce very severe ptyalism before more than two thirds of the grain was taken. I have also seen one grain of blue-pill cause very serious ptyalism; and the same quantity of hydrargyrum cum creta occasion most severe diarrhœa, the smallest doses of any mercurial having this effect with that individual. During the present epidemic influenza (1847) nine grains of blue-pill in three doses, caused sloughing, ulceration of the mouth, and extreme prostration in a case to which I was called.

579. *G.* On the other hand, *some constitutions resist the specific effects of mercury most obstinately.* But it must not be supposed that, although the specific effects do not appear, the mercurial has no effect. It may produce some one or more of the injurious effects above described, or it may affect the bowels, and be carried off by diarrhœa, or excite organic disease of the colon or rectum, especially the latter, or occasion mental disorder with irritative fever. It has also been erroneously supposed that calomel and other preparations of mercury are not injurious to infants and young children, because the specific operation very rarely appears in them. But this is not altogether the case, for the constitutional powers and the digestive organs often suffer more or less, although not manifestly, or at the time; and in older children several of the injurious effects which I have mentioned not infrequently occur, especially ulceration or even sloughing of the cheeks and gums, and irritative or hectic fever, with remarkable pallor, anæmia, or chronic irritation of the bowels, with enlargement of the mesenteric glands.

580. *H. The diagnosis of mercurial salivation* is always difficult, unless the exhibition of some mercurial shortly before the appearance of the discharge be admitted or ascertained. And even when the admission is made, the quantity may be so small as to allow of doubts as to its influence. In certain constitutions, and especially in depressed and debilitated states of such constitutions, after exhausting discharges, and during cold, humid, and north-easterly winds, with more or less exposure to such weather, a small dose of a mercurial may cause excessive salivation; and, if this discharge be attended by much soreness of throat, it is most difficult to determine whether the salivation is

actually the result of the mercurial, or merely symptomatic of the sore throat and cold. If it proceed from the mercurial, there will generally be some tenderness of the gums, a soft and flabby state of the sides of the tongue, and it will generally be more obstinate. A patient under my care took, under the circumstances of general health and exposure just mentioned, five grains of blue-pill. In two or three days afterwards he was attacked with salivation and sore throat. He possessed, however, no constitutional tendency to be affected by mercury; and yet this dose, in his existing state, and from exposure to cold and humidity, appeared to have occasioned the attack, which probably also the sore throat aided to develope. When severe and prolonged salivation has been once produced by a course of mercury, a very slight cause may reproduce it a long period after it had ceased. A common sore throat or cold is sometimes alone sufficient to have this effect. But in this case, as well as in others not caused by mercury, there is no mercurial fœtor; for, although the breath is often very offensive in non-mercurial salivation, the peculiar mercurial fœtor is absent. A very severe or even dangerous effect may be produced on the mouth by a very small dose of mercurial, when conjoined with or given at the same time as tartarized antimony or colchicum.

581. *a.* It ought also to be recollected, that several medicines and poisons occasionally excite salivation. The preparations of gold produce this effect as certainly as those of mercury. Those of copper have often a similar operation; and those of iodine and antimony occasionally exert it. Digitalis and prussic acid sometimes occasion the same effect, and even croton oil and opium have increased this secretion; but this operation, as respects these last, has been loosely observed and recorded.

582. *b.* An *idiopathic*, or spontaneous form of profuse salivation, has sometimes been met with, no medicinal or poisonous cause of it having been detected. Several cases of this form have been recorded, and have continued for months, or even for two or three years, many ounces of saliva having been discharged daily; but in many of these cases the mouth was not affected, and other characteristics of mercurial salivation were wanting. The imagination may excite salivation. Dr. CHRISTISON met with an example of this, which, with other cases of spontaneous chronic salivation, he has noticed in his work. I have seen an instance of profuse salivation follow the contemplation of a disgusting object, but it did not continue longer than a few days. Some of the cases recorded as instances of idiopathic salivation have probably been symptomatic of chronic or structural disease of the *pancreas*, as noticed in the article upon that organ.

583. *c.* Dr. CHRISTISON very correctly remarks, that, in general, mercurial salivation may be *distinguished* from all other varieties, if its progress has been traced from the first appearance of brassy taste and fœtor to the formation of ulcers and supervention of ptyalism. Its characters are also quite distinct at the time salivation just begins. The fœtor of the breath and sponginess and ulceration of the gums at this stage distinguish it from every other affection. But if the mouth is not examined until the ulcers have existed several days, the characters of the mercurial action are much more equivocal. They may not, for example, be distinguished from spontaneous ulceration of the mouth, depending upon general cachexia or unsoundness of constitution, and characterized by extensive ulceration, or sloughing, with ptyalism and gangrenous fœtor. The *diagnosis* of mercurial salivation demands in all cases much attention, not only in a medical or practical, but also in a medico-legal point of view; and, in both regards, there are other *questions* connected with it which require a special attention.

584. 1st. *May salivation not appear until a long period has elapsed after the administration of the mercury has been abandoned?* — Mercury administered in small doses is a cumulative poison, and often produces no effect upon the salivary glands or gums until a certain amount of saturation is produced, this amount varying with different constitutions, or with the same constitution at different times. Hence it may be inferred, that mercury may accumulate in the system without producing its specific effects, and may still remain, in some instances, for a considerable period, being unexcreted, or only partially excreted, but, before its elimination is accomplished, a change in the state of vital power, or of the constitution, takes place, or some new influence comes into operation and developes the specific action of the mercury existing in the frame. Thus may be explained the occurrences of salivation not until some months after mercury has been relinquished. SWEDIAUR has met with instances where the interval was several months; CULLERIER with an instance where it was three months.

585. 2d. *What is the duration of mercurial ptyalism, or how long may salivation continue after the use of mercury has been abandoned?* — Rare instances of very prolonged salivation have been met with by most practitioners—instances of even several months' duration. But cases have been recorded by LINNÆUS, SWEDIAUR, COLSON, and others, of its continuance for periods varying from one to five or six years. These, however, are very rare. Most commonly the mouth and salivary glands return to their healthy states in the course of a fortnight or three weeks; but it is not unusual to observe the period protracted to a month, or even longer.

586. 3d. *May ptyalism, and other specific effects of mercury, recur after a complete intermission, or, in other words, reappear after having entirely ceased, mercury having been discontinued?*—I have above (§ 580.) admitted this occurrence. It has not infrequently been observed by those practitioners who, in former days, were very conversant with the effects of severe or prolonged courses of mercury. Dr. CHRISTISON believes that the occurrence of salivation after two or three or four months have elapsed, without the repetition of mercury, is exceedingly uncommon. It certainly is so at the present day; but it most probably was not so many years ago, when prolonged and severe courses of mercury were often prescribed; and that it was not so formerly, the reasons assigned above (§ 584.), as well as the testimony of HAMILTON, MEAD, MALE, FORDYCE, COLSON, and others, sufficiently show.

587. 4th. *In what manner does small or other doses of mercury prove fatal?* — Death may ensue

from the mildest preparations, and even from comparatively small doses, generally in consequence of severe salivation, or of gangrenous destruction of parts of the mouth and fauces, and the vital depression produced by the mineral and by the local disorganization. The most obvious manner in which death takes place is by extension of sloughing or gangrene of the throat, mouth, cheeks, face, and neck. This result is seldom seen at the present day. But cases are met with in consequence of peculiarity of constitution, or of large doses given to children under the belief that they are much less susceptible of the specific effects of this mineral than adults. In general, when gangrene is the cause of death it begins within the mouth or in the throat, and spreads from thence until it reaches the face. This is most frequently seen in children. But I have seen the ulceration both commence in and extend to the pharynx, and thence to the larynx, producing destruction of this latter part, and death. Sometimes, especially in children, the sloughing begins on the external surface, at a distance from ulceration of the gums and mouth, appearing in the course of a few days after salivation. A small vesicle generally appears on the skin, on one or both sides near the mouth, and is succeeded by a gangrenous or sloughing ulcer, which spreads over the cheek, and proves fatal in a few days. In cases of this nature, both the local disorganization and dissolution are the results of the depression of vital power produced by the mineral. When salivation is excessive or prolonged, death may ensue from the exhaustion thereby produced. But even in this case the mercury has occasioned a poisonous vital depression, the first manifestations of which have been the salivation caused by it; but with this depression, and the exhaustion consequent upon the discharge, the changes produced by mercury in the constitution and the physical appearances and the alterations of the blood should be taken into the account. Mercury may also excite pulmonary and laryngeal phthisis, and cause death, as just mentioned, by the ulceration of the epiglottis and glottis, and the attendant exhaustion and hectic. It may occasion a fatal issue by inducing any one of the several affections I have described above (§§ 569. *et seq.*) as contingent upon the administration of mercurial preparations. When the corrosive preparations of mercury have been administered, death is generally the consequence of the local corrosive action, — of the disorganization caused by them, when taken in large quantity. If this effect is not produced, or is recovered from, they may still cause death from their consecutive effects now described.

588. *I. Of the Physiological Action of Mercury.* — All the preparations of mercury are more or less readily absorbed and carried into the circulation; but it is not ascertained in what state they are absorbed, or by what particular channel, although the lymphatic and lacteal vessels are most probably the chief media. In whatever state the mercurial may be when it has arrived in the blood, it evidently accumulates there, and in the solids, to some extent, especially in some constitutions or conditions of the frame, producing, amongst others, the effects above described. Having arrived in the circulation, it is carried out of the system, either without deposition or accumulation in the solids, or after having been for a time thus deposited, by means of the several emunctories, more especially by the salivary glands, the skin, the pancreas and liver, the intestinal canal, and kidneys. When the mercurial, owing to either the modes of administration or inaction of the emunctories, accumulates in the blood, the tissues may be so saturated with it as to give rise to the changes described, or to admit of the detection of it in the excretions, or even in the structures themselves. In whatever state it may exist in the *blood*, it is so intimately combined with this fluid as to escape detection by the ordinary tests; and destructive distillation is generally required. By this means it has been detected by ZELLER, BUCHNER, SCHUBARTH, COLSON, DEITERICH, and others. In the same way mercury has been found in the *secretions* and *excretions* — in the saliva, the perspiration, the urine, the intestinal secretions, and even in the discharges from ulcers, as shown by CHRISTISON, PEREIRA, and the writers just named. Dr. PEREIRA remarks, that the blackening of the skin mentioned by HARROLD, RIGBY, and others, as having occurred from the use of mercury after the employment of sulphur, shows the presence of mercury in the cutaneous transpiration. The sulphur and the mercury having been thrown out of the system by the skin, and beyond the sphere of the vital power, had entered into union and formed the black sulphuret of mercury, which was deposited on the integument in a pulverulent form. The existence of mercury, in the *reguline state*, in the organic solids, has been asserted by some, and denied by others. WIBMER, COLSON, DIETERICH, PEREIRA, and others, say that it has been found in this state in the bones, brain, synovial capsules, the pleura, the humours of the eye, the cellular tissue, &c. In what part of the system reduction is effected is not ascertained; or whether it has occurred during life or after death. I have seen the mercury in the fluid state in bones which have been long in contact with the surrounding earth, and have viewed the reduction as a *post mortem* phenomenon; but it may have been otherwise.

589. Mercurials, having been carried into the circulation, and even to some extent into the tissues and organs, as they undoubtedly are more or less, certainly affect the states of organic nervous and vital power; changing not merely dynamically, but also otherwise *altering* the innervation of the several organs and structures. The *alterative influence* is displayed, and can be estimated only, by its results, by the effects just described. But, in addition to the altered state of general innervation, and chiefly as a consequence of it, the *blood* evinces marked changes. If salivation be easily produced, the blood either shows no very material change at the commencement, or it exhibits merely a slight inflammatory crust. But after salivation has continued some time, the blood becomes darker, coagulates less firmly, and the proportion of the coagulum to the serum diminishes. If salivation be protracted, the red globules decrease in number very remarkably, and *anæmia* is often very considerable, and always supervenes when salivation is either excessive or protracted. DIETERICH says that the electrical condition of the blood changes from the negative — the healthy state, to the positive state. With this change in the blood, the soft solids are impaired in their vital cohesion, and all

the exhalations and secretions from surfaces and mucous follicles are increased. The heart and lungs are also more or less affected, as Sir B. BRODIE has shown; although more as respects their organic nervous energy, or state of innervation, than as regards the structure. The *structural changes* produced by mercury have been chiefly observed after death from acute poisoning by the corrosive preparations, and have been described above (§ 218.).

590. *K. Treatment.*— When the symptoms are those of *acute poisoning* (§ 216.), then the treatment recommended for that form should be adopted with promptitude and activity (§ 221.); but the varieties of *chronic poisoning* by mercurials require very different measures. — *a. Salivation*, when either excessive or prolonged beyond the intentions of the physician, is that variety which most frequently calls for aid, the means most successful in removing it being also the most beneficial in the treatment of the other varieties of chronic mercurial disease. The patient should be removed to a large, airy, dry, and moderately cool apartment, about 60° Fahr., and entirely apart from those who are subjected to a mercurial treatment. All the linen should be frequently changed, and vicissitudes of temperature avoided. Thus circumstanced, the remedial means may consist of three classes, which may be distinguished as the *antidotal or constitutional*, the *derivative*, and the *local*, which may be successively or contemporaneously employed, or in such succession and combination as the peculiarities and form of the mercurial disorder will suggest.

591. (*a.*) The *constitutional and antidotal means* are limited; but such as they are, they should not be overlooked; for, as the injurious effects of mercury, in any of the forms noticed above, often depends upon the actual presence of mercury in some noxious state, in the circulation, and even in the tissues, and not infrequently upon the irritation this mineral causes in the several emunctories concerned in eliminating it from the system, it is important to resort to such means as are the most likely, by combining with it in the blood and tissues, to render it less deleterious, or even inert. There is probably no substance which may be more beneficially employed with this intention than sulphur, inasmuch as it is readily carried into the circulation, and as readily combines with mercury, whose injurious operation it thus prevents, the sulphuret of mercury being either inert, or nearly so. *Sulphur*, therefore, should be given internally; whilst *sulphur baths*, both warm and fumigating, or as either may suit the peculiarity of the case, may also be called into aid. Formerly the *sulphurets* were given internally for the removal of excessive salivation, but they are very much inferior to the simple precipitated sulphur; and are now employed chiefly in warm medicated baths. Next to the internal use of sulphur may be mentioned the diluted *sulphuric acid*, taken in quantity sufficient to render the drink pleasantly acid; but in cases of very long protracted salivation, or when anæmia has supervened, neither it nor any of the other acids, whether mineral or vegetable, has appeared to me to be of any service, unless combined with an oxide of iron. In these circumstances, the sulphate of iron may be taken in small doses, dissolved in the drink acidulated with the sulphuric acid; or the citrate of iron may be given in fluids containing the citric acid. In treating most of the injurious effects of mercury, the local mischief, in whatever form it may appear, attracts the chief notice; and to it chiefly, and not to the states of the blood and of vital power, which are of the greatest importance, are our remedial measures directed. Various other constitutional means have been recommended; but there are comparatively few which deserve adoption. The most serviceable are the preparations of sarsaparilla; those of iodine; the iodide of iron, and some other combinations of iodine with sarza; the decoction of cinchona, or the sulphate of quinine with sulphate of iron, or common alum, or with the citrate of iron, according to circumstances, or to the amount of debility or of anæmia. In most of the remote or consecutive states of poisoning by mercury, and more especially in mercurial cachexia and affections of the skin, and mercurial periostitis the iodide of potassium, and other preparations of iodine, with sarza, &c. will prove most beneficial.

592. (*b.*) The *derivative measures* which are most serviceable are purgatives and warm baths; and these are serviceable chiefly when salivation has occurred suddenly or unexpectedly; when it is recent, and the patient not much reduced. In these circumstances, the best purgatives are the neutral sulphates dissolved in the compound infusion of roses, to which some additional sulphuric acid, and small doses of the sulphate of iron, may be added: these may be administered at intervals, so as to keep up an action on the bowels; or a full dose of precipitated sulphur may be taken at bed-time, and the saline aperient in the morning, and at mid-day if it be required. Warm medicated baths may likewise be used, or pediluvia. If constipation continue or become obstinate, other more active purgatives may be required, if a recourse to purgative enemata does not accomplish fully the object entertained.

593. (*c.*) The *local means* should have reference to the state and stage of salivation, and of the other symptoms. If salivation be commencing; if it be acute; if it have occurred unexpectedly, or from a small dose of mercury, and be attended by an inflammatory state of the mouth or salivary glands, the topical remedies ought to be soothing, and the local excitement should be calmed by means of demulcent gargles, containing cooling and anodyne substances, as the nitrate of potash, or the hydrochlorate of ammonia, with extract or tincture of opium; or by gargles containing the acetate of lead and acetic acid, with tincture or wine of opium. If the swelling and tenderness around the salivary glands be considerable at the commencement, a few leeches, followed by fomentations, may be prescribed, and the other means assiduously employed. In the more chronic or atonic stage or state of salivation, the gargles should be astringent and tonic; as the decoction of cinchona or of oak-bark, with alum and sulphuric acid; or with the tincture of krameria. The chlorides, especially the chloride of lime in solution, with creasote; solutions of the chloride of zinc, or of the nitrate of silver; the tincture of myrrh in camphorated demulcents, &c., may severally be employed as gargles. I have seen strong tar-water of great service when used as a gargle, a weaker form of

it having been drank as a constitutional remedy.

594. (*d.*) *The other varieties of chronic poisoning* by mercury are benefited most by the constitutional or antidotal means advised above (§ 591). But, in these varieties, the states of the blood and of nervous energy should receive particular attention. In order to remove the existing depression of vital power, to improve the assimilating processes, and to resist the changes in the blood, especially the progressive anæmia, the iodide of iron in syrup of sarsaparilla, the several preparations of iron, or the mineral chalybeates, in states of combination which the peculiarities of the case will suggest, and many of the usual vegetable or mineral tonics and antispasmodics will prove of essential service. When the nervous system, or even when the mental manifestations betray disorder, the means just mentioned, preceded or attended by the constitutional treatment above recommended (§ 591.), are then also required; change of air and scene, travelling, a dry, bracing air, generous but light diet, aided by occasional recourse to tonics, to chalybeates, to the iodine, and to the natural mineral waters, being also beneficial.

595. vi. STRAMONIUM—THORN-APPLE—*Datura Stramonium.* — Poisoning with this plant is not infrequent, and is generally accidental. But the thorn-apple has been used on the continent for the purposes of aiding the commission of crimes. The whole plant is probably poisonous, but the seeds are the most virulent. It is very slightly irritant, its poisonous action being exerted chiefly on the brain and nerves of sensation. Its operation nearly resembles that of belladonna. The active properties of the plant reside chiefly in an alkaloid principle, described by GEIGER and HESSE, and named *daturia*, or *daturium*; and probably partly in an empyreumatic oil which it contains, resembling that of digitalis. It acts chiefly by absorption, and probably also by its local influence or impression on the nervous systems; for the application of the leaves of the plant to burns or sores have occasioned dangerous effects.

593.* *a.* The *symptoms* produced by stramonium have been most accurately observed and described by Dr. PEREIRA. *In small and gradually increased doses*, it impairs sensibility, thereby alleviates pain, and hence is *anodyne*. Although it allays pain it does not usually produce sleep. Dr. PEREIRA remarks that it has no direct tendency to induce sleep, and hence it *cannot be called soporific*. But indirectly, by alleviating pain, it often disposes to sleep. It usually does not affect the pulse: it slightly and temporarily dilates the pupil, and has no tendency to cause constipation, but rather relaxation. *In larger doses* it causes dryness of the throat, thirst, nausea, giddiness, dilatation of the pupil, obscurity of vision, headach, nervous agitation, disturbance of the cerebral functions, perspiration, occasionally relaxation of the bowels, and sometimes diuresis. *In fatal doses* the chief symptoms are flushed countenance, delirium — usually maniacal — dilatation of the pupil, dryness of the throat, loss of voice, difficulty of deglutition, hot perspiring skin, convulsions, and sometimes palsy. But the symptoms vary in different cases with the dose, and the part or preparation of the plant administered. Of the numerous instances of poisoning by this plant, the following will suffice to illustrate the symptoms: —

594.* In two cases related by VICAT and SWAINE, the chief symptoms were furious delirium and palsy of the extremities. In three instances adduced by ALIBERTO there were delirium, restlessness, constant incoherent talking, dancing, and singing, with fever and flushed face. In a case described by Dr. TRAILL, about eighteen grains of the extract were taken by mistake, and were followed by dryness of the throat, giddiness, dilated pupils, flushed face, glancing of the eyes, incoherence, resembling intoxication, and incessant unconnected talking like that of demency. Emetics were given without effect, and little amendment was obtained from blood-letting, cold to head, or purgatives. But after a glass of strong lemonade vomiting took place, and the patient soon recovered. BOERHAAVE states, that a man gave the powder of stramonium in coffee to a female. It occasioned redness of the features, delirium, nymphomania, loss of speech, followed by fixedness of the eyes, tremors, convulsions, and coma; afterwards tetanic spasm and slow respiration. She was with difficulty roused by the action of emetics, and recovered. In another dangerous case adduced among others by Dr. CHRISTISON, free blood-letting effected a speedy cure. Of a case well described by Mr. DUFFIN, the symptoms were exactly as above stated (§ 593.*). One hundred of the seeds were swallowed; but although the treatment was judicious, death took place in twenty-four hours. Of several cases adduced by GMELIN, six hours were the shortest duration.

595.* *b. Diagnosis.* — VOGHT says, that stramonium is distinguished from belladonna by its affecting more the ganglia, spinal chord, and brain, — by the circumstance of the pulse being little affected by it, and by slowness more frequently than acceleration of pulse being produced by it,—and by its exciting the organic nervous system more strongly, and more directly promoting all the secretions, especially those from the skin. Its operation may be briefly characterised as slightly irritant and energetically alterative as regards sensibility and innervation, whilst it influences less remarkably the irritability of muscular structures.

596. *c. The morbid appearances* consist chiefly of congestion of the brain and sinuses, especially in those cases which terminate early with maniacal excitement and determination to the head. When life has endured for eighteen hours or upwards, the congestion within the cranium is less remarkable. In Mr. DUFFIN's case, the brain was healthy and not congested. The stomach and intestines were natural. There were a slight redness over the pharynx, larynx, and upper third of the gullet, thickening and swelling of the rima glottidis, and a semi-coagulated state of the blood.

597. *d. The treatment* should consist chiefly of vascular depletions, the cold or tepid affusion on the head; emetics or the stomach-pump; lemonade drinks; and the other means advised for *belladonna* (§ 545.).

598. CLASS VII. NARCOTICS, OR STUPEFYING POISONS.—HYPNOTICS.— Several substances have been classed as narcotics, although they are not directly or really narcotic or hypnotic, and produce this effect only contingently upon their anodyne or sedative action — not infrequently as

a consequence of the vital depression or exhaustion which they occasion in a large dose. This error of arrangement, so intimately allied to inaccurate views as to the operation and effects of both medicines and poisons, has been perpetuated by most writers on juridical medicine. But it is of great importance, in a practical rather than in a theoretical point of view, that substances which are simply *anodyne* — which remove pain or paralyse sensibility — should be distinguished from those which exert a more extensive effect, and are *sedative* — which lower nervous and vascular excitement, and depress vital action; and that those substances which are simply *hypnotic* — which merely procure sleep — should also be distinguished from *narcotics* — which do more than procure sleep, which stupefy the senses and occasion a state of lethargy, into which the patient lapses immediately after having been momentarily and with difficulty roused. There is no doubt that several substances produce effects so complicated as to render classification founded on these effects most difficult — that there are some which are not only anodyne, but also sedative or depressing, and withal both hypnotic and narcotic; and it is hence the more difficult to arrange them. Still the difficulty should be met; and, by careful observation, the more prominent effects of these substances should be recognised and assigned to each. I have had occasion to show that several substances which have been classed as narcotics are not actually such, but occasionally manifest more or less of this effect merely as a consequence of the vital depression they produce when taken in excessive doses.

599. The operation of narcotics was once a source of dispute between the chief supporters of the medical doctrines adopted towards the close of the last century. The term *narcotic*, being applied substantively and adjectively to medicines which have the power of stupefying, and impairing the energy of the nervous system, the mode in which this power was excited became the subject of inquiry. As most narcotics have a stimulating influence in small doses, and as the narcotic effect is produced chiefly, or only when they are given in full or large doses, the question was, as to the way in which this latter effect was developed. CULLEN contended that the stimulating effect is owing to the resistance offered by the *vis medicatrix naturæ* to the sedative influence of the substance; and hence, that a large dose is immediately sedative, because this resistance is overpowered. BROWN, on the contrary, maintained that narcotics are in reality highly diffusible stimuli, which exhaust the excitability by the rapidity of their action. Thus CULLEN regarded them as directly sedative, and indirectly stimulant; and BROWN as directly stimulant, and indirectly sedative. The discussions connected with this subject, which may be viewed as constituting an epoch in the history of medicine, are now nearly forgotten, although the topic is not altogether destitute of practical importance. If both doctrines were closely investigated, neither would be found correct; but it is sufficient that we attend to the effects, and observe them correctly. The exact modes in which they are brought about require too minute an investigation to be entered upon at this place.

600. i. CARBONIC ACID GAS — *and admixtures of it with other gases.* — This is the most important of the deleterious gases. It is, as Dr. CHRISTISON remarks, the daily cause of accidents; for it is extricated in great quantity from burning fuel, during the calcination of lime stone or chalk, by the fermentation of beer, and in pits, mines, wells, &c. It is generated during respiration by all animals, and is accumulated to a dangerous amount in apartments where due ventilation is neglected. Owing to these and other sources, being such as admit of the accidental and intentional operation of this gas on the human subject, poisoning by it is of frequent occurrence. Some doubts had been entertained whether it is a positive poison, or simply an asphyxiating gas. But, independently of its action, when concentrated or pure, in irritating and constricting the larynx, and thereby producing suffocation, it is positively and energetically poisonous. This is shown by a variety of circumstances: — 1st. Poisoning by this gas is more rapid than immersion in hydrogen or azote. Immersion in carbonic acid gas will kill an animal outright in twenty-five seconds, and a small bird in fifteen seconds. — 2d. If instead of the nitrogen gas contained in air, carbonic acid be mixed with oxygen in the same proportion, symptoms of poisoning will appear in two minutes in animals which breathe this admixture. Persons have become apoplectic in an atmosphere containing carbonic acid gas in much less proportion, and which has appeared quite respirable upon first entering it. — 3d. Professor ROLANDO (*Archives Gen. de Med.* t. v. p. 132.) found that the land tortoise sustained little injury when the great air-tube of one lung was tied; but instead of tying this tube, he contrived to make the animal breathe carbonic acid gas through it, and death took place in a few hours. — 4th. The symptoms caused by inhaling the gas much diluted may be produced by the application of it to the internal surface of the stomach, or even to the skin. It is well known that aërated water not infrequently causes giddiness and a passing intoxication when drank too freely, especially by persons unaccustomed to it. The sparkling wines owe to this gas a portion of their power of rapid intoxication. M. COLLARD DE MARTIGNY found that, if the human body be enclosed in an atmosphere of this gas, whilst respiration is carried on by the common air, the usual symptoms of poisoning with carbonic acid are produced; and, if the same experiment be made on animals, death will ensue if continued long enough. — 5th. It has been shown by Dr. G. BIRD that death may follow the inspiration of this gas, although the usual changes are produced by the oxygen in the air on the blood, which even may still retain its florid colour. (*Guy's Hosp. Rep.* vol. iv. p. 79.)

601. *A.* When a person attempts to *inhale pure carbonic acid gas*, the throat is irritated so strongly that the glottis closes, and inspiration is impossible. Sir H. DAVY and Dr. CHRISTISON remarked, that the gas causes an acid taste in the mouth and throat, and a sense of burning in the uvula; hence, when a person is immersed in this gas, he dies at once of suffocation. The effects, however, are very different when the gas is diluted, the symptoms resembling those of apoplexy or poisoning by opium, but varying somewhat according to the source from which the gas is

derived, and the vapours or other gases or admixtures consequently breathed with it. It is of importance to recollect that fatal poisoning by this gas may occur where the quantity present is quite insufficient to produce much effect at first, or for some time, or to extinguish a lighted candle; and, consequently, we are authorised in concluding that a gaseous mixture, capable of extinguishing a lighted taper or candle, will almost inevitably prove fatal to animal life. No odour nor taste, also, is perceived when this gas is much diluted.

602. *B.* The *symptoms* experienced by persons exposed to an atmosphere loaded with charcoal fumes, or with carbonic acid emanating from any other source, and mixed with more or less of other gases, are well marked and constant; although, as Dr. GOLDING BIRD remarks, they are far from being distinctly characteristic of the existing cause, as they are very similar to the premonitory signs of apoplexy. A person exposed to these fumes at first experiences an intense, penetrating, and throbbing headach, with a sense of weight and heat, especially about the occipital region; pulsation in, and sense of tightness across the temples; giddiness, confusion of ideas, and failure of memory; increased action of the heart and often violent palpitations, sometimes attended by a disposition to nausea and hysteric sobbing. If the individual be now removed into a current of cool pure air, with warm applications to the feet, which usually in such circumstances become cold, the symptoms gradually vanish. But if he continue exposed to the poisoned atmosphere, a buzzing noise in the ears, partial or total loss of vision, an undefined, vague feeling of intense dread or horror succeed, and are rapidly followed by somnolency or syncope. Subsequently, according to Dr. G. BIRD, all power of volition disappears; the pulse, which was previously above 100, falls to 40 or 50; respiration becomes slow and laborious; the surface universally cold, and often livid; the lips blue or violet; the eyes retaining, in most cases, their lustre. Gradually these symptoms increase in intensity, frequently with the accession of tetanic convulsions, and, in a few instances, raging delirium. White or bloody foam appears before the mouth and nostrils, vomiting takes place, and the sufferer sometimes expires in the act; but he as frequently breathes his last without vomiting, and, in this case, the tongue is protruded, or firmly clenched between the teeth. He is usually found in a calm and sleep-like attitude, the countenance always retaining a placid expression, which even the vomiting, that often occurs in the last moments, had not disturbed.

603. Persons who have been exposed to an atmosphere vitiated by carbonate acid gas, "until insensibility, cessation of pulsation in the smaller arterial trunks, and suspension of respiration supervene, frequently exist for a considerable time, if removed from the poisoned atmosphere — appearing partially to survive; exciting hopes too frequently fallacious: as such persons almost always sink, even after living for several days in a state of somnolency." A case, however, is recorded by Dr. BABINGTON, in which a singularly judicious treatment was successful; and others have since recovered from this very dangerous state.

604. *C.* A small quantity of *the mixed gases*, proceeding from the slow combustion of tallow or oily substances, will produce dangerous symptoms. Dr. BLACKADDER ascertained (*Edin. New Philos. Journ.*, i. 224.), that the vapour into which oil is resolved, previously to its forming flame round the wick excites, even in minute quantity, intense headach. The emanations from the burning snuff of a candle are probably of the same nature, and very poisonous; and an instance of such effect is adduced by Dr. CHRISTISON. A party amused themselves by holding under the nose of a boy asleep, the smoke of an extinguished candle. At first he was roused a little each time; but after half an hour, during which this was repeated, he began to breathe laboriously, and was attacked by incessant epileptic convulsions, and died on the third day. The effects of these emanations are probably partly owing to the presence of an empyreumatic volatile oil, which is an active poison (§ 668.).

605. *D. The admixture of sulphurous acid gas with the carbonic* being inhaled in a diluted state, is extremely deleterious. When, however, the sulphurous acid gas is present in any quantity, the irritant effects produced by it, especially on the lungs and air-tubes, will often prevent accidents which might have occurred if carbonic acid gas only had been present. Instances have been recorded where the admixture of these gases have proved fatal, especially in mines. The symptoms produced by these gases, and those caused by *the gradual contamination of the air in a confined apartment*, in which a number of living beings are inclosed, are very nearly the same, although the causes are not identical. It was found in the instances which occurred in mines, that, although the lights continued to burn, the men were poisoned; the symptoms being difficulty of breathing, pain and beating in the head, giddiness and ringing in the ears, palpitation and anxiety followed by vomiting, weakness and pains in the limbs, and finally loss of recollection. To these succeeded frantic delirium in some, terror in others, and insensibility in the rest. Many retched and vomited. In some the pulse was quick, in others it was slow; in many irregular, and in all feeble. (*See Edin. Med. and Surg. Journ.* xiii. 353, xxxii. 345.)

606. E. *Appearances of the dead body.* — *a. Externally*, these vary with the circumstances of particular cases; but the surface is generally sprinkled with livid spots — often bluish or reddish brown, passing into violet; and these are most numerous in the most depending parts. The limbs are, in some cases, very flexible, in others as rigid. The fingers are often irregularly bent; sometimes stiff and extended. The arms are occasionally thrown across the chest, especially if spasms have preceded death. Opposite statements have been made as to the persistence of the animal heat, and as to the rapid or slow development of decomposition. The tongue is found projecting, and often clenched between the teeth, unless vomiting preceded death, and then it is usually in its natural position. The mouth is often covered with a white or bloody foam. The face is in some cases red and bloated, in others pale and placid. The eyes generally retain their vivacious aspect; they are sometimes injected. The pupils are dilated. The features are always in a state of repose. The interior of the

nostrils, in some instances are lined with a black fuliginous deposit. The abdomen is distended with air. (Dr. G. BIRD.)

607. *b. On dissection* the coverings of the *head* are found injected with blood. The vessels of the dura mater, arachnoid, and pia mater, as well as the sinuses, are found turgid with blood; and serous effusion often exists beneath the arachnoid. The surface of the brain is always injected—often reddish; occasionally the cerebral substance is somewhat softened, and presents the appearance of recent inflammation. The lateral ventricles generally contain fluid, sometimes limited to one side; and serous effusion is met with at the base of the brain. In addition to this congested state of the brain and cerebellum, extravasation of blood is found in a few instances—in one case, universal effusion of blood between the arachnoid and pia mater, and extending to the cerebellum; in another, into the lateral ventricles. Dr. G. BIRD states that the blood found in the cerebral vessels is black in some cases, and florid in others; and even black in some vessels, and florid in others, in the same case. Occasionally the blood is fluid, and very thick; in others remarkably thin; and in some coagulated. Effusion of reddish serum into the *pleura* and *pericardium* is frequent. The *lungs* are sometimes expanded, and full of air and blood, in others collapsed. In many, their tint is blackish violet; in others red, spotted with black; and in some quite natural, and presenting merely the usual cadaveric turgescence and blackness posteriorly. The blood in their vessels is often black, sometimes florid, and even both; the vessels are frequently turgid, but occasionally nearly empty. The cavities of the *heart*, and the *blood* found in them, present as opposite appearances, in different cases, as have been described in respect of the lungs. The same remark applies to the larynx and trachea. The pharynx and œsophagus are usually healthy, and sometimes contain food, as if the patient had expired in the act of vomiting: but in the last moments of life, the contents of the stomach are regurgitated without effort, rather than vomited. The *abdominal viscera* are generally healthy; whatever lesion they present being referable to other causes. The veins are most usually congested, and more or less of serous effusion into the peritoneal cavity is sometimes seen. The blood in the abdominal veins is coagulated in some cases, and fluid in others. The *muscles* are stated to be extremely lacerable, owing to the absence of irritability or vital cohesion; but Dr. G. BIRD contends that such is not the case in some.

608. *F. The modus operandi of diluted carbonic acid gas.*—This physician, who has paid much attention to the subject, concludes from his researches, that an atmosphere containing carbonic acid gas will produce death, although it may contain a sufficient amount of oxygen to support life, *per se*, and to allow the arterialisation of the blood to proceed. On which account, no dependence can be placed on the dark or florid colour of the blood, as arguments for or against poisoning by carbonic acid gas. He considers that this gas, when diluted, acts primarily upon the nervous system; and secondarily, but by no means essentially, upon the circulating fluid: that death is caused by the accession of apoplexy, often attended by serous effusion into the ventricles, or on the surface of the brain, and sometimes even by the extravasation of blood; and that no importance can be attached to the states of the surface, of the features, of the blood, of the limbs and muscles, and of the thoracic and abdominal muscles, as proofs of poisoning by carbonic acid gas. I need only add to this statement, that during the inhalation of this gas, or of admixtures of it with other gases, the injurious action may be produced not only through the medium of the nerves, but also by the passage of the gas itself into the circulation, where it may act more directly on the ganglial nerves of the brain, influencing its innervation, its circulation, and vital manifestations, and thereby giving rise to the symptoms and structural lesions above described. These lesions are chiefly congestion of the vessels of the brain, with contingent serous effusion, and, more rarely, sanguineous extravasation. Beyond these, but little structural change, at least of a precise and obvious nature, is met with, either constantly or generally, although various alterations in the colour and states of both the fluids and soft solids are observed; but they are so different, or even opposite, in different cases, that no importance can be attached to them.

609. *G. Treatment.*—This should consist of cupping, or general blood-letting—but cupping on the nape of the neck generally, and preferably; of an occasional recourse to cold or tepid affusions on the head and neck; of the application of derivative means to the lower extremities, and of stimulative embrocations to the chest and limbs; and of the administration of enemata, containing camphor or asafœtida, with active purgatives, as turpentine, castor oil, &c. The quantity of blood, which should be taken by cupping, ought to be regulated by the symptoms and the progress of the poisonous effects. When these means are inefficient, owing to the existing torpor and insensibility, artificial inflation of the lungs, and even recourse to electricity, or to electro-galvanism, should not be neglected; more especially as the progress of such cases is not generally so rapid as to preclude the adoption of these means. When the temperature is much depressed, warm baths, with salt, mustard, &c. in the baths, should not be neglected. In Dr. BABINGTON's case, decided benefit was derived from the inhalation of oxygen gas. But much will depend upon the adaptation of the various means to the states of the nervous system, and of the circulation at the time of their administration. As many of the cases of poisoning by this gas are of considerable duration, sufficient time is generally afforded to ascertain the efficacy of remedies.

610. ii. CARBONIC OXIDE GAS. — When this gas is thrown slowly into the veins, it gives the arterial blood a brownish tint, and induces, for a short time, a state resembling intoxication (NYSTEN). But it is certainly more deleterious than the experiments of NYSTEN would seem to indicate. An assistant of Mr. HIGGINS, after inhaling this gas two or three times, was seized with giddiness, tremors, and approach to insensibility; succeeded by langour, weakness, and headach. Another assistant, having previously exhausted his lungs, inhaled the pure gas three or four times, and was suddenly deprived of sense and motion,

and continued insensible for half an hour; during which time he was apparently lifeless, with the pulse nearly extinct. Various means were tried for rousing him, without success; till, at last, oxygen gas was blown into the lungs. Animation then returned rapidly; but he was affected for the rest of the day with convulsive movements, stupor, violent headach, and quick, irregular pulse; and after his senses were restored, he suffered from giddiness, blindness, nausea, alternate heats and chills, succeeded by feverish, broken, but irresistible sleep.

611. iii. CARBURETTED HYDROGEN GAS — COAL GAS. — *The several species or admixtures of carburetted hydrogen gas* are more or less narcotic and injurious, although much less noxious than sulphuretted hydrogen. — *A.* Sir H. DAVY found that, when he breathed a mixture of two parts of air and three of *carburetted hydrogen*, he was attacked with giddiness, headach, and transient weakness of the limbs. When he breathed this gas in a pure state, the first inspiration caused a sense of numbness in the muscles of the throat; the second, an overpowering sense of oppression in the chest, and insensibility to external objects; during the third, he felt sinking into death, and the mouth-piece dropped from his hand. On recovering his senses, which happened in less than a minute, he continued to suffer for some time from a suffocating feeling, extreme exhaustion, and feebleness of the pulse. Throughout the rest of the day he was affected with weakness, giddiness, and rending headach. Colliers, however, breathe the air of coal-mines without apparent injury, although strongly impregnated with this gas; and NYSTEN found it inert when injected into the veins. Probably the concentration of the gas, or the impregnation of the air with it, requires to be carried up to a certain point before its poisonous operation is produced.

612. *B. Coal gas and oil gas*, which are mixed and variable gases, appear to be inert, or nearly so, when very much diluted; but since their introduction for the purposes of illumination, many fatal accidents have occurred from the respiration of air contaminated with them. *Coal gas* consists of hydrogen, proto-carburetted hydrogen, bi-carburetted hydrogen, carbonic oxide, nitrogen, and carbonic acid in varying proportions. Several cases of poisoning with this admixture, owing to the contamination of a large proportion of air with it, are recorded. The *symptoms* were vertigo, cephalagia, confusion of intellect, with loss of consciousness; nausea, with vomiting; general weakness and vital depression; partial paralysis, convulsions, and the usual symptoms of general asphyxia. In illustration of the effects of coal-gas, Mr. TAYLOR adduces the following. In January, 1841, a family in Strasburg respired for fourteen hours an air contaminated with coal-gas, owing to its escape from a pipe. On discovery of the accident, four persons were found dead. The father and mother still breathed; but the father died in twenty-four hours: the mother recovered. —An old lady and her grand-daughter, who had been annoyed by the escape of coal-gas during the day, retired to bed, and were found dead about twelve hours afterwards. In the case of the Strasburg family, there was probably not more than 8 or 9 *per cent.* of coal-gas contained in the air of the rooms, because, when the proportion is a little greater, the mixture with air becomes explosive; and a candle was burnt out, and a fire burning in the stove, showing that no explosion had taken place. In the other cases, a strong smell of coal-gas could be perceived when the bodies were found, though the air could be breathed. Coal-gas, therefore, like other gaseous poisons, may destroy life if long respired, although it be so much diluted as not to be injurious at first, or for a short time.

613. *C.* On *dissection*, the appearances have been observed chiefly in the instances just mentioned. Of the five bodies poisoned by this cause in Strasburg, the *post mortem* examination evinced a great difference in the appearances; but the chief alterations were congestion of the brain and its membranes, remarkable engorgement of the pia mater, and intense redness of the whole surface of the brain. In three of the cases, there was an effusion of coagulated blood on the dura mater of the spinal canal. The lining membrane of the air-passages was strongly injected; and there was spread over it a layer of thick viscid froth, tinged with blood. The substance of the lungs was of a bright red colour, and the blood was coagulated. In the other cases, recorded by Mr. TEALE (*Guy's Hosp. Rep.* No. viii.), there was also congestion of the brain and its membranes, with injection of the lining membrane of the air-passages; but in these cases the blood was remarkably liquid.

614. *D. Treatment.*—The odour of this gas will generally lead to the detection of it, and to prevention of its injurious operation; but it may penetrate into dwellings and apartments in a very insidious manner; and if this takes place where persons are asleep, the results may be fatal in a few hours. The exact proportion of this gas to the air respired which will destroy life has not been ascertained; but from 7 to 12 *per cent.* of this gas in air will most likely be sufficient, as this proportion has killed rabbits and dogs in a few minutes. Indeed, a quantity a little below the explosive proportion, or 7 or 8 *per cent.*, may be sufficient. The treatment where poisoning has taken place is the same as I have advised for the effects of carbonic acid gas (§ 609.).

615. iv. CHLOROFORM — *perchloride of formyle — chloric æther, and æther-vapour.* — I have already made mention of *æther-vapours* (see §§ 322. 336—340.) in connection with their effects as an *intoxicating* and *paralysing* or *anæsthetic agents.* I shall now notice them as powerful *hypnotics*, or *narcotics*, their hypnotic operation being the most speedily developed, and the most remarkable of known substances. When the effect of sulphuric æther as an anæsthetic agent was first ascertained the advantages to be derived from it in surgery and midwifery were certainly over-estimated, and the dangers contingent on a recourse to it were not always admitted or even recognised. It certainly could not have furnished entire satisfaction to Dr. SIMPSON, who was amongst the most zealous in recommending it in obstetric practice, otherwise he would not have sought for another anæsthetic agent; and he was successful in finding one still more energetic, and probably more safe. But a few months of trial of the sulphuric æther inhalation was thus followed by the discovery of the advantages of inhaling *chloroform.* In February, 1847, Mr. JACOB BELL first employed chloroform, or perchloride of formyle (*Pharmaceut. Journ.* for

February 1847, p. 357.), as a substitute for sulphuric æther, as an anæsthetic or hypnotic agent; and in November 1847, Dr. SIMPSON, apparently unacquainted with Mr. BELL's recommendation, had recourse to it for the alleviation of the pains of parturition. That chloroform, even in small quantity, poured upon a sponge or handkerchief, and held to the nostrils, produces the most profound sopor and insensibility, in a very short period — from a few seconds to a very few minutes — cannot be disputed; and that it may be employed in surgical operations, and in midwifery, so as to prevent any painful sensation, has been already shown on numerous occasions. It has likewise been proved that it is more rapid and certain in its effects than sulphuric æther, and even more safe, thus admitting that the latter is not always quite harmless. I have already pointed out the dangers attendant upon even a prudent recourse to sulphuric æther inhalation, especially in the parturient process (§§ 337, 338.), and I have no reason to infer that the danger is much reduced by the employment of chloroform. Time and close observation will decide as to the amount of benefit or of mischief which may result from the use of this latter. That it may be applied to injurious, to poisonous, and even to felonious purposes, may be anticipated from the facility of its administration, and from the communications respecting it which were instantly made to all the daily and weekly papers in the kingdom. All these hypnotic or anæsthetic agents, if breathed for too long a time, without such intermissions in their administration, or without such precautions as a prudent physician will adopt, may be followed by the most dangerous effects, in respect both of the constitution of the blood and of the nervous masses, especially the brain and medulla oblongata. Time and observation have not yet been sufficient to show the results as to chloroform; but a recourse to it should be made with caution, as an effect so potent as it produces cannot be undergone without some risk in certain states and constitutions. At the moment of writing the above, experiments made and published by Mr. T. WAKLEY, (*Lancet*, Jan. 1. 1848) demonstrate the poisonous operation of chloroform and the æthers when inhaled by the lower animals, and the following case was published by Dr. GULL.

616. A boy aged eleven, in good health, but his nervous system a little weakened by confinement to bed, his heart and lungs sound, was about to have the flexor tendons of the knee-joint divided, in GUY's Hospital, and chloroform inhalation was adopted. "A small quantity of chloroform, not exceeding thirty drops, was put upon a cone of bibulous paper, and placed over his mouth and nose. In less than a minute he was entirely insensible, the pupils becoming widely dilated, and the pulse small and frequent. As the operation was being proceeded with, his consciousness partly returned, and a few drops of the chloroform were put upon a handkerchief and applied to the nose. He was instantly affected, and to such a degree that there was the greatest apprehension of his never rallying. The pulse was very feeble, 56; the breathing so indistinct as hardly to be distinguished; the face pale, lips congested; the symptoms of collapse extreme. Ammonia was employed, and, after about five minutes, he gave two or three deep inspirations: it was, however, more than fifteen minutes before he was out of danger. Subsequently a small quantity of brandy was administered. He complained of headach. For a long time after he recovered his special senses and power of motion, general and perfect anæsthesia of the surface existed. The following day he was quite well." — (*Lond. Med. Gaz.* December 10, 1847, p. 1036.) The above case sufficiently illustrates the injurious action of this substance; and, in the present state of our knowledge and experience of the inhalation of this and other preparations of æther, it is unnecessary to make any further observation.

617. v. CICUTA VIROSA — *Water-hemlock.* — This indigenous plant has sometimes produced accidentally the most noxious effects. The roots and the rest of the plant are poisonous, but the roots especially. Among other instances related by WEPFER, eight children ate the roots instead of parsnips. Two of them died. The first symptoms in these two were swelling in the pit of the stomach, vomitings, or efforts to vomit, total insensibility, involuntary discharge of urine, and lastly severe spastic convulsions. One died in half an hour, the other soon after. One who recovered, had convulsions, followed by deep coma, from which she could not be roused for twenty-four hours.—*a.* According to GUERSENT (*Dict. Des Sciences Méd.* t. v. p. 205.) the first *symptoms* of poisoning with cicuta are dimness of sight, vertigo, acute headach, pain in the stomach, anxiety, dryness of the throat, thirst, and vomiting; followed by enuresis, epileptic convulsions, lethargy, and insensibility, in some cases; and by delirium, unconsciousness, or convulsions with tumefaction of the face, protrusion of the eye-balls, &c. in others.

618. *b. On dissection* METZDORF met only with congestion of the blood-vessels of the brain and its membranes. GUERSENT, in addition to congestion of the cerebral vessels, mentions flaccidity of the parietes of the heart's cavities, and congestion of the lungs and liver with a dark fluid blood. The body is sometimes swollen, the abdomen distended with air in the intestines, and the surface covered with livid spots. But the only changes which are constant are the congestions now mentioned. The same *treatment* as recommended for *belladonna* (§ 545.), or *opium* (§ 657.) is required for poisoning with this plant.

619. vi. CONIUM — *Hemlock* — *Conium maculatum* — *Conia.* — This plant may certainly be viewed as the κώνειον of Greek writers, — the celebrated *Athenian state poison*, by which SOCRATES and PHOCION died, — the *cicuta* of the Romans. NICANDER states that this plant brings on obliteration of the mental faculties, dimness of sight, giddiness, staggering, stifling, coldness of the limbs and death by asphyxia. "A view of its effects," says Dr. CHRISTISON, "which differs little from the modern notions of the poisonous action of the spotted hemlock." Dr. PEREIRA adds, that the ancients regarded κώνειον as having the power of discussing tumours — a virtue which has been assigned to hemlock by writers of the present day. The effects of conium upon animals and upon man are somewhat different, the action on the former more closely resembling that of its alkaloid, *conia.*

620. *A. Symptoms.* — *a.* In *small doses* it produces but slight or hardly manifest effects. But it sometimes causes, when long continued, disorder of the digestive organs or nervous system, dryness of the throat, thirst, and occasionally the reduction of

swellings or of tumours, and an eruption on the skin. If the dose be gradually and much increased, the effects are often more severe; delirium, syncope or coma supervening. The ancients believed that hemlock exerted a specific influence over the mammæ and testicles, preventing the development of the former, and causing wasting of the latter, especially in girls and boys respectively. The Arabians entertained similar ideas. These effects have even been imputed to it in modern times.

621. *b.* In *large or poisonous doses* the symptoms indicate a dangerous affection of the cerebro-spinal system. In some of the best-recorded cases, coma was the prominent symptom, the effects being similar to those of opium. In other instances, convulsions or violent delirium, or both, were prominent. A soldier had partaken, with others, of a soup containing hemlock leaves, and soon afterwards fell asleep. In the course of an hour and a half, his comrades became alarmed on finding themselves affected with giddiness and headach; and the surgeon was sent for. He found the soldier, who had fallen asleep, in a state of insensibility, from which, however, he could be roused for a few moments. His countenance was bloated, tumid, and bluish; the pulse only thirty, and the extremities cold. The insensibility increased until he died, three hours after taking the soup. Two cases are described by Dr. WATSON, which were fatal in the same short period. Giddiness, coma and convulsions were the principal symptoms. When the dose is not sufficient to prove fatal, there is occasionally paralysis attended by slight convulsions. Sometimes there is frantic delirium.

622. *B. Conia, Conein, Cicutine,* or the alkaloid of conium, in which the active properties of the plant chiefly reside, exists in it in combination with an acid — the *coniic?* Its effects are known only by experiments on the lower animals. On them it acts as a powerful paralysing agent; affecting first the muscles of voluntary motion, then the respiratory muscles of the chest and abdomen, lastly the diaphragm, and thus producing death by asphyxia (CHRISTISON). Convulsive tremors, and twitches of the limbs are also sometimes observed. Dr. PEREIRA remarks that "the primary seat of the action of *conia* is probably the spinal chord (probably also the medulla oblongata and brain)." "In this conia and strychnia agree; but in the nature of the effect, as Dr. CHRISTISON has observed, to be the opposites of each other. Conia exhausts the nervous energy of the cord, and causes muscular paralysis; strychnia irritates it and produces permanent spasm of the respiratory muscles." These effects of conia suggest its employment in convulsive and spasmodic diseases.

623. *C. On dissection,* the chief alterations which are observed are congestion of all the vessels within the cranium, and a very fluid and dark state of the blood. In a case examined by Drs. CHRISTISON and COINDET, the vessels within the head were not particularly turgid, but the blood was every where remarkably fluid. Death in this case was produced in an hour, by two ounces of a strong infusion of hemlock leaves with the same quantity of whisky, which was swallowed in the morning fasting, at the suggestion of one of those meddling persons who are so very kind in prescribing for their acquaintances that of which they know nothing. The symptoms in this case were coma and slight convulsions. The fluidity and dark hue of the blood are merely the results, as Dr. CHRISTISON suggests, of the asphyxia, which is the proximate cause of death in poisoning by conium.—The same *treatment* as is recommended for *belladonna* (§§ 545.) or for *opium* (§§ 657.), is appropriate for the effects of conium.

624. vii. HENBANE—HYOSCYAMUS NIGER—*Hyoscyamia,* &c. — All parts of this plant are poisonous, especially the seeds and roots. They produce somewhat different effects upon animals and upon man, being more hypnotic in the former than in the latter.—*A.* In *small doses* they are calming, sedative, and slightly narcotic. Mr. HOULTON has shown that their effects vary much with the age of the plant, the season at which the several parts of it are gathered and prepared, and the mode of preparation and preservation. *Large doses* sometimes procure quietude and sleep, but with no certainty; for they not infrequently occasion dimness of sight with dilatation of the pupil, headache, giddiness, and a state of half-sleeping and half-waking, with a tendency to delirium. In some cases, thirst, nausea, clamminess of the mouth, feverishness, griping and relaxation of the bowels are induced. *Very large doses* much more frequently produces delirium than sound sleep. In *poisonous* doses it causes loss or disturbance of vision, dilatation of the pupil, coma with muttering delirium, distortion of the features and loss of speech, paralysis, with irregular convulsive movements, and occasionally violent delirium, and irritation of the stomach and bowels, with vomiting, griping, and purging.

625. *B.* The special effects of *hyoscyamia,* the alkaloid in which much of the active properties of the plant are believed to reside, have not been fully shown. Dr. MORRIES has ascertained that, like other narcotic and sedative vegetables, as opium, hemlock, tobacco, stramonium, digitalis, &c., hyoscyamus also yields by destructive distillation an *empyreumatic oil* of great activity; its poisonous properties depending upon a volatile principle which is not essential to the oil, and is productive of coma, convulsions, and speedy death.

626. *C. Hyoscyamus,* especially its juice and extract, is most actively poisonous when injected into the blood, less so when applied to the cellular tissue, and still less when taken into the stomach. It is sometimes very active when administered in an enema. It has even produced serious effects when applied to the sound surface, in the form of a poultice. WIBMER was called to a lady affected with sopor, dilated pupils, flushed face, loss of speech, full pulse, and swelling of the abdomen, and found that these symptoms were caused by a poultice of henbane leaves applied over the abdomen to relieve strangury. It *acts* chiefly on the brain, and by absorption into the circulation.

627. *D. Diagnosis.*—The effects of hyoscyamus differ from those of *opium* in being more sedative in small doses, by the affection of the sight and dilatation of the pupils, by the much less, and more uncertain, soporific operation in large doses, and by the delirium, loss of speech and paralysis, with irritation of the bowels, in poisonous quantities. Hyoscyamus differs from *belladonna* and *stramonium* by the less frequent and less remarkable occurrence of gastro-intestinal irritation from it, and by the more manifest appearance of

narcotic or soporific action. It differs also from *hydrocyanic acid* in producing delirium and paralysis, whilst the acid occasions insensibility and convulsion, and more rapid results.

628. *E.* The *other species* of hyoscyamus, as the *albus, aureus, physaloides,* and *scopolia* are said to be equally poisonous with the *H. Niger.* Professor FODÉRÉ states, that the *H. Albus* was boiled and distributed by mistake among the crew of a French corvette. But in a short time after eating it they were all seized with giddiness, vomiting, convulsions, colic, purging, and violent delirium. They were all relieved by emetics and purgatives. The *appearances* in fatal cases have not been described.—The *treatment* is the same as in other cases of narcotic poisoning.

629. *Lactuca virosa, L. sativa,* and *Humulus lupulus,* are not likely to occasion dangerous effects from accident or otherwise.

630. viii. OPIUM AND ITS PREPARATIONS—MORPHIA AND ITS SALTS. — The operation and effects of opium have been investigated by numerous able inquirers, but most satisfactorily by CHRISTISON, PEREIRA, and CHARVET. Since 1821, when I first resorted to the cold affusion in the treatment of poisoning by opium, I have devoted much attention to the medicinal and poisonous properties of this substance, probably the most valuable of all the articles of the materia medica.

631. *A.* The *local action* of opium is exerted chiefly on the nerves of the part, more especially on the sentient nerves, but the irritability of contractile tissues is also affected. When a watery solution, or fluid extract, of opium was applied to a painful part, or to a surface denuded of its cuticle, I found that the morbid sensibility was removed in the one case, and numbness caused in the other; and that the intestinal movements were arrested by the application of the same preparation to the mucous surface of the intestines. This latter result was also remarked by Dr. W. PHILIP. Dr. MUNRO found, that opium injected into the cellular tissue caused palsy of the hind-legs of a frog. Several physiologists have shown that, when opium is applied to the internal surface of the heart of a frog, this organ ceases to beat.

632. *B.* The *remote effects* of opium have been fruitful topics of discussion. It was formerly believed that the impression made by opium upon the nerves of the stomach, or of any other part, is conveyed sympathetically to the brain; but it has been conclusively proved that the poison itself enters the circulation, and acts directly either upon the brain, or upon the ganglia and ganglial nerves, supplying the brain and its blood-vessels; this latter alternative appearing to me the most probable. (See § 654. *et seq.*) According to ORFILA's experiments, the action of opium is most energetic when injected into the veins. Opium is more active when applied to a wound, than when taken into the stomach; and it often acts, when thrown into the large bowels, with as much energy as when taken by the mouth; and sometimes even more energetically. Much, however, of the effect produced by it, when thus administered, depends upon the state of the large bowels, as respects fœcal accumulations, &c., upon the period of its retention, and the mode of its exhibition.

☞ 633. *a.* It has likewise been shown by ORFILA and others, that a large dose of opium affects the lower animals somewhat differently from man, causing in the former accelerated circulation, vertigo, palsy of the hind legs, convulsions, varying from tremors to violent spasms, and a wakeful kind of slumber, attended by convulsions upon the least excitement; whilst in man simple sopor and coma are most commonly produced, and convulsions much less frequently. According to CHARVET's researches, opium acts as a poison to all animals, when given in a large dose; and, on the lower animals, it produces congestion of the brain and consequent sopor, irritation of the nervous centres and convulsions, and a directly sedative effect on the muscles.

634. *b.* The *effects of opium* in the human subject are of great importance in a practical as well as in a toxicological point of view. In *small doses,* opium acts at first as a stimulant of the heart and arteries, causing also a slight exhilarating effect upon the mind, and sense of fulness in the head. A pleasurable state of the whole system is experienced, and a capability of greater exertion. These symptoms are followed, in about two hours, by a diminution of muscular power and of susceptibility to the impression of external objects, and by a desire of repose with tendency to sleep. The mouth and throat generally become dry, thirst is increased, desire of food is impaired, and costiveness produced. These effects are much diminished by frequent repetition, and an increase of the dose is required to produce them in an equal degree.

635. *c.* In a *larger dose,* or full medicinal dose, or from two to four grains, the stage of excitement is sooner followed by depression. Dr. CRUMPE (*Inquiry into the Nature and Properties of Opium,* 8vo. 1793, p. 85.) took two grains and a half of opium when his pulse was at 70. After a quarter of an hour his pulse rose to 74, and after half an hour to 80. After fifty minutes the pulse had fallen to 64; but in an hour and a half it returned to 70. With the acceleration of the pulse, the skin becomes hot, the mouth and throat dry; thirst is increased, and the appetite diminished. But the symptoms of excitement are soon followed by indisposition to exertion, by sluggishness of the senses, confusion of ideas, and an irresistible desire to sleep, which is generally attended by dreams, sometimes pleasing, at other times frightful. Upon waking, especially if three or four grains have been taken, nausea, or even vomiting, headach, furred tongue, listlessness, and costiveness are complained of; but the accession of these may be prevented by repetitions of the dose, and by even a gradual diminution of it. Dr. BURNES states, that he had made a very fatiguing night march in India with a Cutchee horseman, and assented to his proposal of halting for a few minutes, which he employed in sharing about two drachms of opium between himself and his jaded horse. The effect of the dose was soon evident on both, for the horse finished a journey of forty miles with great apparent facility, and the rider became more active and intelligent.

636. *C.* The *poisonous effects of opium,* or the *symptoms of poisoning,* where opium is given in a single dangerous dose, begin with giddiness and stupor, generally without any previous excitement. The stupor rapidly increases; the person becomes motionless, and insensible to external impression; he breathes slowly, generally lies

quite still, with his eyes shut and his pupils contracted—occasionally remarkably contracted; the cornea is dull or no longer glistening, and the whole expression of the countenance is that of repose. In this stage he may be slightly or momentarily roused by violent excitement, as pinching, &c. As the poisoning advances, the features are ghastly, or slightly livid; the pulse feeble and irregular; respiration shallow, slow, or gentle, and sometimes catching; the muscles exceedingly relaxed; and, lastly, the pulse becomes remarkably slow, unequal, and irregular, and death rapidly ensues, if assistance is not promptly administered. If recovery takes place, the sopor is succeeded by prolonged sleep, which is followed by headache, giddiness, nausea, and vomiting, loathing of food, distressing languor, and constipation.

637. *D.* OPIUM-EATING.—*The excessive use of opium, habitually,* produces a species of slow poisoning, of so long duration as not to be generally viewed as poisoning, although the effects are allowed to be injurious. The habit is usually acquired by persons who have derived advantage from opium in various states of disease, especially painful affections, hysteria, diarrhœa, and numerous other disorders. The habitual opium-eater may be instantly recognised by his appearance; by the emaciation of his body; by a withered, yellow, or sallow countenance, and sunken, glossy eyes; and by the bending of the spine and lame gait. His digestive functions are remarkably impaired, his appetite is lost, and he hardly eats. He scarcely has more than one evacuation in the week. As the habit becomes more confirmed, his strength diminishes, and the craving for the stimulus becomes even greater; and to produce the desired effect, the dose must constantly be augmented. The mental and bodily powers are ultimately destroyed, and a universal impotence is the last result.

638. I have met with in practice several instances of opium-eating, in which the symptoms were less severe. In these, however, although the quantity taken was excessive, the appetite was not materially, or even at all impaired; and the bowels were often regular, unless when deprived of the usual dose of the opium. The pulse varied from 80 to 100; and the skin was occasionally dry, but more frequently perspirable, or perspired very freely. The effect produced by a desired ordinary dose upon the mental faculties of the opium-eater is usually described as that of calmness, comfort, serenity, and happiness; and a capability of supporting mental exertion and bodily fatigue.

639. When deprived of this substance, the opium-eater is miserable and distressed; and the whole frame betrays the want of it, by the hollow, dark, and sunken orbits; by the haggard appearance of his features; the general weakness and tremulousness, especially of the hands; by the dry and parched state of the mouth and throat, anxious voice and manner, and by loss of appetite and sleeplessness. Many thus affected are anxious to abandon the practice, and make numerous efforts to accomplish it, but they rarely succeed.

640. If the habit be commenced early in life, the person who is its subject seldom becomes older than forty years; and he may die at an earlier age, if the practice has been excessive. When the quantity of opium taken habitually is comparatively moderate, when it is not increased in quantity or frequency of dose, but little injury to the general health often appears for many years; and even an improvement of the health is often remarked when the practice has originated in the use of opium for painful affections, obstinate diarrhœa, certain states of hysteria, &c. Several persons thus circumstanced have been under my care for various disorders, and they described themselves in better health than before the acquisition of the habit. But in most of these the quantity was not remarkably large, and was generally not materially augmented. But in others, who take very excessive quantities, either of laudanum or solid opium, and still more remarkably in those who do not confine their indulgence to opium, but have recourse also to other intoxicating beverages to excess, visceral disease slowly and silently supervenes, with its usual consequences; the constitutional powers sink, and death sooner or later takes place. I have thus met with organic diseases of the liver and stomach, of the heart and kidneys, palsy, and tubercular phthisis slowly appear, and ultimately terminate in dropsical effusions, which treatment could not control. I lately attended a gentleman, a graduate of Cambridge, of most Herculean frame, with my friend and former pupil, Mr. PYPER. That gentleman took habitually the largest amount of opium that I have heard of having been taken by one person; but, not content with this, he indulged also in several bottles of wine in the course of the day, and sometimes in strong ale and in spirits. Although scarcely above thirty years of age, his powerful constitution and frame were broken down, his liver was enlarged, and dropsical effusions had supervened.

641. *E.* OPIUM-SMOKING is rarely practised in Europe. But it is not infrequent in numerous countries in the East; and it is the favourite mode of intoxication in China. Dr. PEREIRA has collected most instructive accounts of this practice. MARSDEN states, that the *smokeable extract* is made into pills, about the size of a pea. One of these being put into the small tube that projects from the side of the opium-pipe, that tube is applied to a lamp, and the pill being lighted, is consumed at one whiff or inflation of the lungs, attended by a whistling noise. The smoke is never emitted by the mouth, but by the nostrils, and sometimes, by adepts, through the passage of the ears and eyes. Mr. SMITH, surgeon, of Pulo Penang, states that, although the practice is most destructive to those who live in poverty and distress, or who carry it to excess, yet it does not appear that the Chinese in easy circumstances, and who have the comforts of life about them, are materially affected, in respect of longevity, by the private addiction to this vice. It would appear that, as in *opium-eating* so in *opium-smoking*, a moderate addiction to the habit is not attended by remarkable injury to the constitution; and that it is excess in either that is productive of injury.

642. *a.* The *first effect* on opium-smokers is to render them more animated and loquacious. "Gradually the conversation drops; laughter is occasionally produced by the most trifling causes, and to these succeed vacancy of countenance,

pallor, shrinking of the features, so that the smokers resemble persons convalescing from fever, followed by a deep sleep for half an hour to three or four hours. An inordinate quantity causes headach, vertigo, and nausea. The Malays are rendered outrageous and quarrelsome by the opium-pipe." It is extremely difficult to discontinue this vice; yet there are many instances of its being done. This destructive practice deteriorates the physical constitution and moral character, especially of the lower orders. Its effects on the system are manifested by stupor, forgetfulness, impairment of the mental powers, emaciation, debility, sallow complexion, lividity of the lips and eyelids, langour and lack-lustre of the eyes, loss of appetite, sweatmeats or sugar-cane being most relished.

643. In the morning the opium-smoker has a most wretched appearance, and is unrefreshed by sleep, however profound. He experiences a remarkable dryness and heat in the throat, with depression and restlessness, which incite him to have recourse to the opium-pipe; and if it be not resorted to, there is great prostration, torpor, vertigo, discharge of water from the eyes, &c. If the privation be complete, coldness of the body, aching pains in various parts, feelings of bodily and mental misery, and sometimes diarrhœa, are complained of. Total privation has even been followed by death, if the habit has been long continued and excessive. A close resemblance may here be traced between the effects of *opium-smoking* and *tobacco-smoking* (§ 527.). The latter is as injurious as the former, when as excessively practised; and the one habit, as well as the other, occasions more or less general and sexual impotence, and entails on the offspring a weak, decrepit, and stunted growth, and a delicate and strumous constitution. How weak and debased must be the mind that, by the selfish and excessive indulgence of a petty vice, sacrifices not only his own health, but also the health and constitution of his offspring, and the ability of perpetuating his name and lineage!

644. *F. Diagnosis of poisoning by opium.*—The effects of this drug may be mistaken for *apoplexy* or *syncope*, or for the *stupor* consequent upon an attack of *epilepsy*, or upon *suppression of urine*. But the sopor of opium is different from the coma of these, inasmuch as the individual is capable of being momentarily roused from the former, unless death be very near, by means of pinching, tickling, brisk shaking, or loud talking. The state of restored consciousness is, however, frequently imperfect, and is speedily followed by lethargy. When convulsions attend poisoning by opium, the difficulty of distinguishing it from *epilepsy* is greater; but even then the patient may be momentarily roused, which is impossible in the epileptic paroxysm. In all the maladies, moreover, just enumerated, the pupils in the majority of instances are dilated or natural; and partial paralysis, or even more complete palsy, attends many cases of them; whereas in opium-poisoning the pupils are remarkably contracted.—Sopor from *intoxication* may be confounded with opium-poisoning, but the redness of the conjunctiva, the ferrety eyes, the full and rapid pulse, and the odour of alcohol in the breath, will generally indicate the nature of the case. Poisoning by opium is not infrequent in *infants* and *children*; and it is in them very generally attended by convulsions. It is with great difficulty distinguished from *infantile convulsions*, proceeding from cerebral or other affections. Contraction of the pupil is almost the only indication of this poison having been given; the history of the case, and other circumstances which his acumen will suggest, will in some measure guide the physician. The diagnosis of poisoning by other narcotics than by opium is noticed where they are treated of.

645. *G. The quantity of opium which may be fatal* will necessarily depend upon the state of the stomach and of the nervous system at the time of taking it.—*a.* During painful or spasmodic disorders, and in states of mental excitement or irritation, very large doses of opium may be taken with comparatively little effect. A lady in a state of great excitement and irritation took an ounce of laudanum when going to bed, with a suicidal intention; but she was surprised in waking in the morning and finding herself alive with rending headach, nausea, and feeling of general disorder, from which she soon recovered, no aid having been administered. I have repeatedly prescribed, and once taken, as much as four grains; but I would not advise a larger dose to be given; and even this dose may be followed by unpleasant effects in some constitutions, especially the susceptible and delicate, and when the system is depressed or where there is a tendency to apoplexy; and even a smaller dose may be serious when administered in an enema or in a suppository. Mr. TAYLOR states that a man was killed by ten grains of solid opium; and a woman of middle age by eight grains given in two doses. Dr. CHRISTISON says that the *smallest dose of solid opium* which has been known to have proved fatal to an adult, was four grains and a half mixed with nine grains of camphor, death having taken place in nine hours. In a case recorded by Dr. SKAR, it is doubtful whether death was caused by two or by four drachms of the tincture. A lady suffered very serious symptoms from twenty drops of the tincture administered in an enema; and Dr. STEINTHAL states that one grain of opium, in a clyster, occasioned alarming effects. Idiosyncrasy may be the cause of the danger produced by small quantities of the drug. On the other hand, recovery has taken place from very large doses, when vomiting has soon occurred or been procured by treatment, or when they have been taken on a full stomach, or in states of nervous excitement. In such circumstances even as much as four ounces of the tincture has failed to produce death, as in a case mentioned by Mr. TAYLOR.

646. *b. Infants and children* are remarkably susceptible of the influence of opium, and instances of poisoning among them by over-doses of the preparations containing opium are very frequently met with. An instance is reported (*Lancet, Febr.* 1842) of an infant, two days old, having been killed by one minim and a half of the tincture; and that of another by two drops. A child four months old was nearly dead in consequence of having taken one tenth of a grain of opium. Less than half a grain was given to a child four years and a half old: it soon became comatose, and died in seven hours. Dr. MERRIMAN met with an instance of excessive stupor produced in an infant a month old, by a single drop of laudanum; and he met with two instances of death caused by a

small dose of Godfrey's Cordial, which contains opium. Even twelve or fifteen drops of paregoric elixir may prove fatal in an infant. In most fatal instances in children of poisoning by opium, the post mortem examination affords little or no information; congestion of the brain, and of the lungs, with fluidity of the blood, have been the chief appearances, which I have remarked.

647. *H. The periods which elapse from the administration of the poison until the commencement of its effects* is various. A large quantity in the form of a tincture taken on an empty stomach begins to act in a few minutes. Coma seldom comes on before half an hour has elapsed. The interval is sometimes considerable even when the tincture has been taken. Dr. CHRISTISON refers to a case where it was considerably more than an hour after two ounces and a half of the tincture and a drachm of the extract had been taken. Opium in the solid form generally requires a longer time to act than the tincture. DEBRUELLES, however, records a case where two drachms of solid opium produced sopor in fifteen minutes; and in a case published in America, the largest quantity of it ever known to have been taken at once, did not occasion this effect until an hour had elapsed. The interval may doubtless be prolonged if the opium be taken by a person already excited by spiritous liquors, or intoxicated. Mr. SHEARMAN relates the case of a man who, in a state of intoxication, took two ounces of laudanum, and had no material stupor for five hours; but he ultimately died.

648. *I. The period at which death takes place* varies from *two hours*, the shortest period, to *forty-eight hours*, the longest period; but most fatal cases terminate between six and twelve hours after the ingestion of the poison. Those who live above twelve hours generally recover, if they be judiciously treated. Instances, however, have occurred where an apparently efficacious treatment has been too soon suspended or relinquished, owing to appearances of rapid recovery, and a relapse has supervened and carried off the patient. In eight fatal cases of poisoning by opium, reported by Dr. BECK, the smallest quantity taken was one drachm, the largest one ounce and a half. The shortest time between the taking of the poison and death was eight hours, the longest twenty hours.

649. *K. Several preparations containing opium* have produced fatal effects, especially when administered by ignorant or careless persons to infants or children.—(*a.*) *Paregoric elixir*,—the compound tincture of camphor, which contains somewhat less than one grain of opium in half an ounce, has caused death. A child between five and six years of age was killed by a dose which contained about one grain of opium; and another aged seven months by a dose equal to a quarter of a grain of opium. (*See Pharm. Journ., April*, 1845, p. 464., — (*b.*) *Dover's Powder.* — Pulvis ipecacuanha compositus has also been fatal to children. In one case, four grains of this powder, equal to two-fifths of a grain of opium, caused death; and in another, ten grains caused the death of an infant in twenty-four hours. — (*c.*) *Syrup of Poppies* is said to contain one grain of the extract of English opium to one ounce. The common dose of it to an infant of six or seven months is half a drachm. But this should be the largest dose allowed. Owing, however, to this dose, or its equivalent for other ages, being much exceeded, and owing to a mixture of tincture or infusion of Turkey opium, the strength of which is often variable, being substituted for the true syrup of poppies, poisoning has often occurred from this medicine. Seven children died from this cause in 1837. In a case alluded to by Mr. TAYLOR, half a teaspoonful of this syrup caused the death of an infant six months old. The narcotic symptoms were developed in three quarters of an hour. The syrup in this case was probably prepared with tincture of opium in excessive quantity. — (*d.*) *Decoction of Poppies* has not infrequently been fatal to infants. A teaspoonful of it has been fatal to a healthy child. A woman boiled two poppy heads in a quarter of a pint of milk, and gave two small spoonfuls of this decoction to her infant. In an hour the child fell into a deep lethargic sleep, the breathing became stertorous, and in ten hours it died. A maid servant gave an infant two teaspoonfuls of a decoction of one poppy-head in a small pot of water. The child was found dead in the morning. The brain and its membranes were much congested, and the ventricles contained bloody serum.—(*e.*) Several *nostrums*, especially the "*black drop*," and Battley's "*sedative solution*," which are much stronger than the officinal tincture, have produced fatal effects. Mr. STREETER states that a drachm and a half of the latter was fatal to a lunatic, and 20 minims killed an old woman. "*Godfrey's Cordial*," and "*Dalby's Carminative*," which contain a small quantity of opium, have caused, in some instances, the death of infants to whom they had been given in large doses.

650. *L. Morphia and its salts.*—Poisoning with the salts of morphia has occurred in several instances. The *acetate* and the *muriate of morphia* have been the salts usually employed. The symptoms differ but little from those produced by opium, but spasms or convulsions are more frequently observed after morphia than after opium. The acetate of morphia has been estimated at four times the strength of pure Turkey opium; but I believe that pure morphia, and especially either of the salts just named is five times the strength of opium. It is difficult to determine the quantity which may be injurious. I have seen one-third of a grain given for the first dose produce unpleasant or even distressing effects. It singularly happened, that the lady, whose case was alluded to above (§ 645.), as having taken with a suicidal intention, during extreme mental excitement, a large quantity of laudanum, and recovered from it without any assistance and without any suspicion of the act, had prescribed for her by me, many years afterwards, one quarter of a grain of the acetate of morphia, and although she had then recovered from so large a quantity of opium, this dose of the morphia produced very distressing effects, with a sense of sinking and symptoms of vital depression, requiring powerful stimulants to remove. Dr. KELSO (*Lancet, Sept.* 1839), suffered dangerous symptoms from having taken about half a grain of the muriate; and Mr. TAYLOR was informed that an adult was killed by three grains taken medicinally; and he adds that there is reason to suppose that half a grain of the acetate caused the death of a lady to whom it had been given medicinally when in a state of ill health. Dr. CHRISTISON mentions a

fatal case from the ingestion of ten grains, death taking place in twelve hours, although the stomach had been completely cleared of the poison within half an hour from the time when it was taken. One-fifteenth part of a grain applied, *endermically*, produced severe cerebral symptoms in a case alluded to by Mr. TAYLOR.

651. The effects of either of the salts of morphia will depend much upon the state of the person at the time, who takes it. A large dose, from half a grain to a grain, may be of service, or at least not injurious, even when given for the first time, in states of nervous or vascular excitement, during excessive pain, and in several spasmodic diseases; but either of these quantities may be dangerous or even fatal, if it be given to a person morally and physically depressed, or to one possessing weak vital resistance, or in a state of marked debility and ill health. These salts should never be given to children under ten or twelve years of age. I speak generally, some exceptions being admitted among children not much below this age. The observations offered above, as to the operation of opium when administered by the rectum (§ 632.), equally apply to the salts of morphia.

652. I am acquainted with seven ladies, who have either lately been, or are still occasionally, under my care, and who *habitually take excessive quantities of the acetate of morphia*. The acetate is the salt which they all employ; and they all take it in solution, with the addition of acetic acid, and, in some instances, of an aromatic spirit or tincture. The quantities taken at one dose in these cases, vary from two to six or seven grains, which are generally taken thrice daily. In three of these cases, the quantity has not been materially increased for eight or nine years; but during that time sundry efforts have been made gradually to diminish the quantity, but they have never been steadily persevered in, a gradual increase, and return to the larger quantity, having soon followed. The effects have not appeared in these cases materially different from those of laudanum.

653. *M. Appearances after death by opium or its preparations.*—In a case of poisoning by opium in a child four years old, death having taken place in eleven hours, I found the following appearances. There was considerable lividity of the back, and more depending parts of the body. The vessels and sinuses of the brain were much congested, with a dark fluid blood; and more serum than usual was found at the base of the skull, and in the ventricles. The vessels of the medulla oblongata and spinal chord, and the vertebral sinuses were remarkably engorged. The lungs were congested with fluid blood. The right cavities of the heart also contained blood. There was slight redness of the villous coat of the stomach and duodenum. In a case referred to by Dr. CHRISTISON nearly similar changes were observed in the brain and lungs; but, although the body had been kept only two days in the month of February, the belly emitted a putrid odour when opened. Congestion within the cranium, with more or less serous effusion, and congestion of the lungs, the blood being dark and fluid, have generally been observed. Dr. BRIGHT and Mr. TAYLOR met with a spot of ecchymosis on the surface of the brain in addition to unusual turgescence of the vessels. Dr. CHRISTISON remarks that congestion and serous effusion are by no means universal, for in a case which proved fatal in seven hours, and which he examined, neither of these changes was very apparent. Extravasation of blood within the cranium is a rare effect of opium. In the case of a female, who died eight hours after taking two ounces of laudanum, Dr. JEWEL found several clots of blood in the substance of the brain, and one, which lay in the anterior right lobe was an inch long. (*Lond. Med. and Phys. Journ.*, Feb. 1816.) Redness of the stomach is by no means general, and no inflammatory changes are observed. Lividity of the external surface of depending parts is commonly observed, and is owing to the fluid and dark state of the blood. But the blood is not always fluid, at least in all parts of the body. It is chiefly, however, in the cavities of the heart, where it has been most frequently found coagulated. In four cases referred to by Dr. CHRISTISON there were clots found in both ventricles. This physician has particularly noticed the rapid passage of the body into putrefaction, both in cases which have come under his own observation, and in those recorded by others. Of a body, which had been kept only thirty hours in a cool place in December, the cuticle easily peeled off, and the joints were flaccid, an acid smell being exhaled. In other cases, the early progress of putrefaction has been observed, but not constantly or even generally. The poison may sometimes be found in the stomach, or its smell may be detected; but as frequently neither can be detected, especially when a considerable time has elapsed before death has taken place, owing to the absorption or partial digestion of it, or to its discharge by vomiting, or the stomach-pump. In the latter case, the opium may be detected in the matters evacuated from the stomach.

654. *N. Modus operandi of Opium.*—That the active and odorous principles of opium are absorbed is proved — 1st, by the opiate odour being often perceived in the breath of persons who take opium, and according to BARBIER, in the perspiration and urine; 2d, by the narcotic influence of the milk on infants when the nurses have taken opium: this I have observed on several occasions; and 3d, by the assertion of BARRUEL, that he has detected morphia in the blood and urine, after the ingestion of large doses of opium; but this requires further proof. That the effects of opium upon the frame are due chiefly to the absorption of it, is shown by the following circumstances:—The effects produced by the injection of opium into the veins are the same in kind, but more intense in degree, as those which follow the administration of it by the mouth; and the constitutional effects produced by the drug are proportionate to the absorbing powers of the surface to which the drug is applied. The effects of opium are, 1st, *primary and local*; 2d, *secondary and remote*.

655. *a.* The *direct* or local action is on the nerves, as already shown (§ 631.). It most probably excites or stimulates the nerves primarily; but this influence is only temporary and of short duration, and is followed by anæsthesia and paralysis — by a privation of energy or power. The *remote* operation is exerted chiefly on the brain, medulla oblongata and spinal chord; or rather upon that portion of the ganglial system and nerves supplying the nervous centres, and the blood-vessels of

these centres, and their membranes, through the medium of the blood, either principally or altogether; or partly also by the propagation of the direct or local impression, or influence produced by the drug. That the remote effects are produced upon, or by means of, that portion of the ganglial system supplying the large nervous centres, and consecutively upon the brain, rather than upon the brain more immediately and independently of this part of the ganglial system, is indicated by the fact of the structure of the brain being itself as insensible of, and, as far as our senses enable us to judge, as little influenced by irritants applied to it, as is the structure of any other secreting organ — of the liver, kidneys, &c. as well as by various other considerations and analogies, and more especially by what is known or presumed of the functions of the ganglial system.

656. *b.* As to *the nature* of the effect thus produced upon the nervous system — upon the ganglial and the cerebro-spinal, it may be inferred, with tolerable truth, to be primarily *exciting*, when the dose is small or moderate, and consecutively *hypnotic*, *narcotic*, and *alterative*; but that, when the drug is taken in excessive quantity, the exciting operation is not recognised, whilst the consecutive effects are most prominent and intense; the alterative effect, however, being evinced chiefly in cases of chronic poisoning by opium —by opium-eaters and opium-smokers, and where opium in any form or dose is taken frequently for a long period. The *proximate cause of death* by opium may be referred partly to the extreme congestion of the brain and medulla oblongata caused by it, and partly to the gradual extinction of the influence exerted by the ganglial system upon the cerebro-spinal centre. Most probably the depression or exhaustion of this influence causes the congestion, which, in its turn, aggravates and ultimately extinguishes the influence of this part of the ganglial system; or, the presence of the poison in the blood of the cerebral vessels may so congest them by depressing the energy of the ganglial nerves supplying them, as to paralyse the brain, and gradually arrest all the functions more immediately depending upon the cerebro-spinal system. According to either of these views, which differ but little from each other, the paralysis of sensation, and motion — the extinction of consciousness and volition, — is soon followed by paralysis of the respiratory movements; and asphyxia, with its usual results—congestion of the lungs, and a dark and fluid state of the blood — is the manner in which death takes place.

657. *O. Treatment of poisoning by opium, or its preparations.* — The obvious intentions are, 1st, to remove the poison as promptly as possible; and, 2d, to counteract and remove the effects which have been produced, and prevent the accession of others.—*a.* The stomach-pump should be resorted to as speedily as possible, and the stomach completely emptied and washed out by means of it. When the stomach has power to act, emetics may be employed. The best emetics are the sulphate of zinc, mustard mixed in water, or a strong solution of salt; but, in order to excite the paralysed stomach more completely, camphor and capsicum may be given with the sulphate of zinc, this last being administered in a dose of half a drachm or two scruples, which may be repeated in a short time, if the first dose fails to act. When the stomach-pump is not at hand, a long tube or a catheter with a bladder attached to it, as advised by Mr. BRYCE, may be substituted. After the stomach has been filled with warm water from the bladder, the tube is to be turned down so as to act upon the contents of the stomach as a syphon. When emetics are inoperative, and the stomach-pump or its substitute cannot be obtained, then it has been recommended to inject tartar-emetic in the veins; but more than a grain should not be ventured on, and care must be taken not to allow the introduction of air. This, however, is a hazardous practice, and seldom required, when the means already, and those about to be advised, are duly employed.

658. (*b.*) The removal of the lethargy already produced by the opium, is best accomplished by affusion of cold water on the head and neck, as first recommended, and its effects illustrated, by Mr. WRAY and the Author. (See *Lond. Med. Rep.* xviii. 26.) Children may be placed in a warm bath, to which mustard is added, and the cold affusion on the head momentarily adopted. In all cases, the cold affusion should not be continued too long at a time, but employed at intervals, or with the return of the lethargy. It will often be found that, when emetics have been given without effect, owing to the paralysed state of the stomach produced by the narcotic, the cold affusion will have the effect of rendering them sufficiently operative, especially if the fauces are tickled with a feather at the same time, or soon after the affusion has been employed. Other means of rousing the patient should not be overlooked, and may be resorted to, in the intervals between the affusion. Flagellation on the palms of the hands, on the feet, or back; making the patient to walk between two assistants; stinging with nettles, pinching, &c. have severally been found of more or less service. Various internal excitants may be exhibited, as asafœtida, ammonia, musk, capsicum, camphor, and may even be administered in enemata; and various exciting odours or vapours, as those of ammonia, aromatic vinegar, may be held at interval, near the nostrils. If these means fail, electricity galvanism, or electro-galvanism, may be adopted. As death is evidently proximately caused by asphyxia (§ 656.), artificial respiration should be resorted to, in extreme cases, especially if the case is too far advanced to be benefited by cold affusion, or when this latter fails, which, however, will rarely occur, if judiciously employed. Frictions over the chest, with stimulating embrocations — with camphor, ammonia, capsicum, &c. will be found to aid the influence of artificial inflation of the lungs. Instances have been published by Dr. WARE, of Boston, United States, and Mr. WHATELEY, of the good effects of artificial respiration, in almost hopeless cases of poisoning by this drug.

659. *c.* The subject of *antidotes against the effects of opium* has been examined by ORFILA, and he has found all those which have been proposed, at various times, quite unsuccessful as long as the poison still remains in the stomach, the only exception being the decoction of galls. When the poison has been as completely removed as possible, camphor, green-tea, and strong coffee have been found of service in keeping the patient awake,

wholesome from the poisonous species; but these cannot be relied on, for the former may become injurious owing to the circumstances just stated, and to others not fully recognized or explained, if their appearances be not duly observed. Much of the unpleasant effects produced by them has been owing to the carelessness of the collectors who have gathered some of the poisonous species, as well as of the esculent species, when they have become old or sickly, and mixed them with those which are wholesome. This is not infrequently the case when mushrooms are gathered from the fields for the manufacture of ketsup. The surest *tests of deleterious fungi* are, an astringent, styptic, hot or pungent taste, and a disagreeable pungent odour, an orange or rose-red colour, or a blue tint soon after being cut; and the circumstance of their growing in tufts or clusters from the stumps or trunks of trees. The poisonous properties of fungi have been supposed to reside in a certain principle which has been called *fungin*, but its nature and physical properties are imperfectly known.

672. *B.* The *symptoms* produced by poisonous fungi vary from those of extreme irritation of the gastro-intestinal mucous surface to those of fully developed narcotism; but generally they are an association of both classes, either predominating in different cases. A man ate by mistake several of the *Agaricus campanulatus*, but, before ending his repast, and not above ten minutes after he began it, he was attacked with dimness of vision, debility, giddiness, trembling, and loss of recollection. On obtaining assistance his countenance expressed anxiety; he reeled about and could hardly articulate; his pulse was slow and feeble. He soon became so drowsy that he could hardly be kept awake. Vomiting was produced by sulphate of zinc, and he gradually recovered. (*Lond. Med. and Phys. Journ.* xxxvi. 451).

673. Several soldiers ate a quantity of the *amanita muscaria*. In the evening, some hours afterwards, they began to complain of anxiety, a sense of suffocation, frequent fainting, burning thirst, and severe gripes. The pulse became small and irregular, the body bedewed by a cold sweat, the features changed, and the nose and lips of a violet tint. To these supervened tremblings, tumefaction of the abdomen, and a profuse fœtid diarrhœa. The extremities became cold and livid, the pain of the abdomen intense, delirium and coma took place, and death followed. In the former case the symptoms were those of narcotic poisoning; in the latter, those of irritation and vital depression. In other instances the symptoms are those of gastro-intestinal irritation, conjoined with narcotism, or with narcotism and extreme vital depression.

674. Six persons ate carp stewed by mistake with the *amanita citrina*. Three of these had vomiting, followed by deep sopor, but recovered. One had violent cholera, but recovered also. Two (children) became profoundly lethargic and comatose; emetics had no effect, and death soon ensued. Six persons ate a quantity of the *hypophyllum sanguineum*, and from twelve to thirty hours after the poisonous meal they experienced pain in the stomach, a sense of impending suffocation, and violent efforts to vomit. To these were added sopor, and several hours afterwards tetanic spasms and convulsions; other severe symptoms, varying in character with the quantity which had been taken, also supervening in the progress of the cases. In one profound lethargy and general coldness of the surface; in another vomiting, bloody stools and yellowness of the skin; in a third, delirium, tremblings, coma, and convulsions; in a fourth loss of speech and severe dysentery; and in a fifth colic and inflammation of the bowels, without diarrhœa. Those who recovered remained long in a state of delicate health.

675. Dr. Christison ascribes the tardiness of the approach of the symptoms in some cases to the indigestibility of most of the fungi, which, in some instances is so great, that portions of them have been discharged by vomiting as late as fifty-two hours after they were swallowed. But this slowness of operation is not generally observed, for the effects sometimes appear in a few minutes. The most immediate effect produced by poisonous fungi is paralysis of the vital actions of the stomach, the symptoms afterwards appearing with a rapidity in proportion to the development of the morbid action. An important characteristic of poisoning by mushrooms, as this physician has remarked, is the great *durability of the symptoms*. Even the narcotic effects of some fungi have lasted above two days; and Orfila has adduced instances in which the gastro-intestinal irritation has continued from a fortnight to three weeks after the more acute symptoms had subsided.

676. When wholesome mushrooms disagree owing to idiosyncrasy, the symptoms are chiefly those of severe indigestion, following upon, and often continuing a considerable time after, an attack of vomiting and purging. "There is some reason for suspecting that even the best mushrooms, when taken as a principal article of food for a long time, will prove injurious," and induce a peculiar depraved habit of body, leading to external suppuration and gangrene. Dr. Christison adduces from Rust's Magazine an instance of a family who were seized with an intermittent fever, and an eruption on various parts of the body, of abscesses which discharged a thin ill-conditioned pus, passed rapidly into spreading gangrene, and proved fatal to two persons. No other cause could be assigned for the concurrence of these symptoms in six persons in one family, than the circumstance of their having lived for two months almost entirely on mushrooms, the only person who escaped having merely slept in the house, but had his food where he worked.

677. Dr. Christison has directed attention to a fact, of which medical men should be aware, that poisoning may be, and actually has been, perpetrated by the intentional admixture of vegetable or mineral poisons with wholesome mushrooms; and that when the murderer is dexterous in the choice, and mode of administering the poison, such cases may readily escape suspicion, and even when suspected might not be cleared up without difficulty. But, in these cases, the only decided proof of poisoning by some other substance mixed with mushrooms, or with preparations of them, is the actual discovery of another poison.

678. *C. The appearances in fatal cases.* — The surface of the body is generally stated to be livid, and the blood to be fluid; and exudations of blood are observed from the natural openings. The digestive canal is distended by fœtid air, and in some cases presents inflammatory appearances,

passing in places to gangrene. The stomach, unless there has been vomiting or diarrhœa, often contains fragments of the poison; and these fragments may be found as late as the second or third day, either in the stomach or in the intestines. The liver is often congested. The lungs are generally gorged. The vessels of the brain and its membranes are commonly turgid. In a case referred to by Dr. CHRISTISON, the arteries, as well as the sinuses, were distended with blood; the pia mater and arachnoid were of a scarlet colour, and the substance of the brain was red. The choroid plexuses were excessively gorged; and a clot of blood, as large as a bean, was found in the cerebellum.

679. *D. Treatment.* — Dr. CLENDINNING, in a learned and interesting lecture on poisonous fungi (*Lond. Med. and Surg. Journ.* vol. vi. p. 168.), remarks, that the remedies recommended by NICANDER consist chiefly of emetics and wine. Horse-radish and mustard are amongst his vegetable means. White vitriol is also advised by him; and for drink or vehicles for solid medicines, oxycrate and wine. The first object is to effect the expulsion of the poison; and as there are no poisonous substances of equal power that take so long a time in developing their action as fungi, so there is none against which emetics may be administered with equal prospects of advantage at advanced stages, or after so long a period from the ingestion of the poison. There is no antidote to the poison of fungi known, and hence the expulsion of them should be the chief intention. After this end is attained, the inflammatory irritation, and the narcotic and other nervous symptoms should be allayed by means appropriate to the prominent features of the affection; by the means required for gastro-intestinal irritation and inflammation, when these predominate; and by the measures recommended for narcotic poisoning when this is the prominent character, more especially by cold affusions, external derivatives, and other means suggested when treating of opium-poisoning (§ 658 *et seq.*).

680. iv. HEMLOCK-DROPWORT — *Œnanthe crocata.* — ORFILA states that this plant may be mistaken for hemlock, and that a single medicinal dose of the extract taken instead of the extract of hemlock might prove fatal. The *symptoms* are heat in the throat and stomach, delirium, stupor, and convulsions. Dr. PICKELLS has collected thirty cases of death from eating the root. The symptoms were insensibility, delirium, and tetanic convulsions. Mr. HOWELL has mentioned eleven cases, of which two were fatal. The symptoms were chiefly convulsive, both in these and in eight others detailed by Mr. RAY. In a case described by Mr. HOULSTON, they were at first giddiness, rapidly followed by coma and violent convulsions. In none of the fatal cases was life prolonged beyond four hours; and in several death took place within an hour. The *post mortem* appearances are generally slight, consisting of inflammatory redness of the internal surface of the digestive canal and congestion of the brain. Portions of the roots are sometimes found in the stomach, as in the cases of four persons who were lately killed by this poison, out of fourteen who had eaten it by mistake. (See *Lond. Med. Gaz.* May, 1844.) The *treatment* is the same as in cases of poisoning by fungi (§ 679.).

681. v. GRAIN, OF VARIOUS KINDS, is sometimes poisonous, owing to disease. — 1. *Spurred rye* — *Secale cornutum*, or *ergot* — is most commonly a cause of slow poisoning, in the form of a disease which is described, according to the form it assumes, under the articles GANGRENE and SPASM. (See also ERGOTISM.) — *Unripe grain, spoilt grain, mouldy bread* or *biscuits*, or grain or bread of any kind, which has become injured from keeping too long or otherwise, will produce disease of a chronic or slowly developed form — a true state of slow poisoning — when made a principal article of diet, or when partaken of for too long a period; and if the grain, either before or after its preparation as food, be much injured, severe symptoms may appear from having taken it at a single meal.

682. *b.* The *symptoms* usually produced by spoilt grain or bread are generally those of gastro-intestinal irritation, and but slightly or contingently those of narcotism; and, according to the nature and state of these articles, the symptoms may assume the form of *acute* or *chronic diarrhœa*, or *dysentery*, or of *scurvy*, or *scorbutic dysentery*, under which diseases the subject is fully entertained. Grain, however, may be injurious from other causes, — from the presence of the ova of insects, or of a variety of minute insects; and from the admixture of some vegetable poison, as the *darnel-grass*, or some *poisonous leguminous seeds*.

683. vi. LABURNUM — *Cytisus Laburnum.* — The bark and seeds of the common laburnum contain an active poison called *cytisine*. Dr. TRAILL met with two cases of poisoning by the seeds; and Dr. CHRISTISON has reported an instance of chronic poisoning caused by the bark, the symptoms being chiefly those of gastro-intestinal irritation, of which the patient did not recover for some months. The symptoms in Dr. TRAILL's cases were coldness of the whole surface, lividity of the face, and complete insensibility. MM. CHEVALLIER and LASSAIGNE, who discovered the active principle, *cytisin*, in the seeds, gave eight grains in four doses to a man, which occasioned giddiness, violent spasms, frequency of the pulse, and consequent exhaustion. (CHRISTISON.)

684. vii. LEGUMINOUS SEEDS, especially the *Lathyrus cicera* and the *Ervum ervilia*, or bitter vetch, have been found in France, productive of chronic poisoning, chiefly in consequence of the accidental adulteration of flour with them. The *symptoms* have been usually weakness of the limbs, partial or complete palsy, or stiffness of the joints, and weakness and tremors of the lower extremities. They more properly belong to the class of *depressing and paralysing poisons* (§. 261.).

685. viii. LOLIUM TEMULENTUM — or *darnel-grass.* — The seeds of this plant are irritant and acrid, and powerfully narcotic. They have proved deleterious, and even fatal, owing to accidental adulteration of flour or grain with them. Dr. CHRISTISON states, that when mixed in bread, darnel-grass has caused headach, giddiness, somnolency, delirium, convulsions, paralysis, and even death. M. CORDIER found, by experiment on himself, that very soon after eating bread containing the flour of darnel-grass, he felt confusion of sight and ideas, languor, heaviness, and alternate attacks of somnolency, and vomiting. The bread

was commonly vomited soon after he ate it. Seeger has related cases in which the somnolency was more deep, and general tremors also present. Many years ago, the inhabitants of the poor's house at Sheffield were attacked with symptoms of poisoning by porridge, which was supposed to have been made of meal accidentally adulterated by the darnel. The chief symptoms were a piercing stare, quivering of the lips, frontal headach, dilated pupil and confusion of sight, small tremulous pulse, violent agitation of the limbs, twitches of the muscles, and palpitation. In twelve hours all those attacked were well, but two, who had strong convulsions in the subsequent night; they also eventually recovered. (*Lond. Med. and Phys. Journ.* xxviii. 182.) In some instances, loss of speech and somnolency are the most prominent symptoms; whilst in others gastro-intestinal irritation predominates, occasioning vomiting and purging.

686. ix. Yew-tree — *Taxus baccata.* — The berries and leaves of the yew-tree are extremely poisonous, and sometimes act without either vomiting or purging. Dr. Percival states, that a table-spoonful of the *fresh leaves* was administered to three children, of five, four, and three years of age, as a vermifuge. Yawning and listlessness followed. The eldest complained of pain in the abdomen, and vomited a little; but the other two suffered no pain. They all died within a few hours of each other. Mr. Taylor adduces a case by Mr. Hurt of poisoning by the *berries* of this tree. A child, aged three and a half years, ate some yew-berries, and, about an hour afterwards, appeared ill, but did not complain of pain. It vomited part of its dinner, mixed with some of the berries. A medical man was sent for; but the child died of convulsions before he arrived. On *inspection*, the stomach was found to contain mucus and half-digested pulp of the berries and seeds. The mucous membrane of the organ was reddened and softened. Other instances of death by this poison are recorded, but they furnish no additional information. I believe that this poison acts as an *acro-sedative*, rather than as an *acro-narcotic*; but its effects have been very imperfectly observed.

687. Class IX. Septic Poisons. — This class of poisons has been doubted, or rather the operation of certain poisons in rapidly dissolving the vital cohesion of the tissues, to and near which they may be applied, has been disputed; and, certainly, if any one were inclined to surrender the reports of more than one of his senses to the inferences of hypothesis, to such a one may doubts of the existence of this particular action appear reasonable. It is true that the poisonous agents which are thus capable of loosening, with more or less rapidity, the cohesion of living tissues, and of disposing them to enter into different physical conditions, are few; although many possess this power indirectly, or by giving rise to a succession of morbid actions, of which a septic condition, or a state of loosened or almost entirely dissolved vital and physical cohesion, is the most advanced. These latter, however, fall not under the present category; although the rapidity with which this ultimate result is produced, as respects some of them, might countenance such an arrangement. I may, nevertheless, allude to some of these incidentally. Dr. Christison observes, when noticing this topic, that "if we were to trust the impressions the vulgar entertain of the effects of the bites of serpents, the poisons now mentioned would be considered true *septics* or putrefiants, for they were once universally believed, and are still thought by many, to cause putrefaction of the living body. This property has been assigned them, probably on no other grounds than that they are apt to bring on diffuse subcutaneous inflammation, which frequently runs on to gangrene." (*Op. Cit.* p. 575.). I confess myself possessed of the vulgar belief that the local effects of the bites of serpents are not inflammatory, however this much used and abused appellation may be qualified by certain adjuncts as diffusive or diffuse, gangrenous, destructive, sloughing, phlogistic, sthenic, asthenic, dynamic, adynamic, and twenty others, employed to convey certain ideas of morbid conditions, as they may suit a theory, or subserve an hypothesis. But any one, who has witnessed the bite of a poisonous snake, who has seen the swelling, infiltration of the tissues, the coldness, the arrest of capillary circulation, the softening and almost dissolution of the textures, and the subsequent rapid decomposition of the part and of those in its vicinity, — all which takes place in a few minutes, and is consummated in an hour or two in some instances — may not consider the word *septic* as altogether misapplied — at least until a better one is supplied, or unless we submit to a periphrasis. But the more local alterations are not the only phenomena, for the remote effects, the extreme depression of organic nervous influence, and of the vital manifestations generally, are equally rapid and remarkable.

688. The poisons which most undoubtedly belong to this class are chiefly the secretions of snakes and other reptiles, although there is reason to believe that several other secretions or morbid matters will produce analogous changes in the healthy body when inoculated with them, — that the secretions from small-pox, from plague, from gangrenous sores, from glanders and farcy, from erysipelatous parts, and from sloughing, gangrenous or putrid animal substances, will so contaminate the parts into which they are inserted or inoculated, as to produce either a constitutional disorder specifically the same as that of which it is the product, or a state of local disorganization rapidly passing into vital destruction, accompanied by dangerous, and often fatal, constitutional disturbance. The inoculation of small-pox in the Negro constitution produces, in many instances, on some occasions — in the majority of cases in certain circumstances, as I have myself witnessed, a putrid or septic condition, the confluent eruption consisting of a black sanies contained in the softened dermis, which, with the circulating fluids and soft solids, rapidly deliquesce, as it were, into dissolution, before even respiration had ceased, and without any indication of antecedent excitement, or unusual re-action.

689. I have seen the foul secretion from the throat of a patient about to die of scarlet fever produce sloughing of that portion of the integuments of another person with which it had remained for some time in contact, although the cuticle was stated to have been unabraded before the morbid secretion came in contact with it. The experiments of the French pathologists, already

referred to, sufficiently prove the septic and disorganizing effects of putrid animal and vegetable matters when introduced into the healthy textures. It is supposed that, when a morbid secretion, or putrid animal secretion, occasions more or less of vascular injection of the part with which it comes in contact, or pain in connection with vascular injection or tumefaction, before disorganization ensues, this ultimate result is then the consequence merely of the morbid action more immediately preceding it, and that this action—more properly want of action, is inflammatory. But the truth is that the septic agent, applied to the living part, deprived of its natural protection, or otherwise exposed, depresses the vital or the organic nervous endowment of that part, diminishes the tone of its capillaries, and weakens the vital cohesions of its tissues. As these changes proceed, the vessels are congested, the circulation through them is impeded, and ultimately ceases, and the part dies; although, in many instances, where the contaminating or poisonous agent is not sufficiently active thus to overpower or to annihilate the vitality of the part, and of the whole body, various attempts are made, by means of the vital resistance of the body to oppose these changes, and to develope vascular reaction, whereby they may be the more successfully resisted. According to the intensity of the cause, relatively to the state of vital power and resistance, either of the part or of the body generally, or of both, will the effects, both local and general, thus vary; the more virulent or intensely contaminating or septic agents, destroying not only the part, but also the whole frame, and even hastening the physical dissolution of the body, without either vital resistance or vascular re-action being manifested, the less intense agents admitting of the development of both, in more or less efficient forms. In this latter case the septic tendency may be hardly apparent; and during the procession of morbid changes which the septic agent produces, congestion of, serous effusion into, and destruction of, the cellular tissue, and spreading inflammation and disorganization of the adjoining tissues are the most prominent organic lesions. My limits will not permit me to pursue the consideration of this subject, which, however, is discussed at length under other heads, especially under CELLULAR TISSUE (§§ 9 *et seq.*), DISEASE (§§ 87 *et seq.*), ERYSIPELAS (§§ 26 *et seq.*), INFECTION (§§ 11 *et seq.*), and INFLAMMATION (§§ 54 *et seq.*); whilst various specific maladies furnish illustrations, not only of the subject, but also of the principles for which I have contended, more particularly the HÆMAGASTRIC, AND THE SEPTIC OR GLANDULAR PESTILENCES, SCARLET FEVER, AND SMALL-POX. I therefore conclude with a brief notice of the effects produced by the poison of serpents, &c.

690. i. POISONOUS SERPENTS. — Many of this class of reptiles are more or less poisonous. The *viper*, or *coluber berus* — *vipera berus*—is the most common poisonous serpent in Europe; the *cobra de Capello*, or *coluber naja*, in the East Indies, and the several species of the *rattlesnake*, or *crotalus*, in America. But our information as to the genera and species of serpents or snakes which are actually poisonous is limited, notwithstanding what has been adduced by FONTANA, REDI, ATWELL, HORNER, ORFILA, and others. The bite of the *viper*, which is the only poisonous snake in Britain, seldom occasions death, although in other countries of Europe its poison is often much more virulent than in this; but the season of the year varies the intensity of the poison, which is greatest in summer and autumn.

691. *A.* The *symptoms* are acute or lancinating pain in the part wounded, commencing either instantly, or not for several minutes after the infliction of the injury, according to the intensity of the poison. The pain extends rapidly towards the trunk or centre of the body; and swelling, with redness or discolouration, passing to a livid hue, supervenes. These local changes are followed by faintness, or full syncope, bilious or convulsive vomitings, difficulty of breathing, copious cold sweats, dimness of vision; a small, quick, weak, and irregular pulse; yellowness of the skin; disturbance of the mental faculties, and, in the most dangerous or fatal cases, the rapid progress of these symptoms and gangrene of the wounded part. Death may ensue, either rapidly or slowly; or recovery may take place, according to the virulence or activity of the poison, relatively to the powers of the individual, or the aid and treatment he has received. Dr. WAGNER mentions two cases where the injury was on the toes, and death took place before assistance could be procured. In a case referred to by Dr. CHRISTISON, a burning pain was felt in the bitten foot, followed by intense pain in the belly, vomiting, incessant thirst, and death in three hours. Dr. BRAUN (*Rust's Magazine*, b. xxxii. p. 361.) states, that a man who professed to be a snake-charmer, put the head of the *coluber chersea* into his mouth, but suddenly threw the reptile from him, finding that he had been bitten near the root of the tongue. In a few minutes he became so faint that he could not stand. The tongue swelled a little; the eyes became dim; some saliva issued from his mouth, rattling respiration succeeded, and he died within fifty minutes after he was bitten. On the other hand, death may not take place until one, two, or even three days after the inoculation of the poison. The poison of the common viper is said not to be so dangerous in France as that of the *red viper*, which may cause death in a very few hours.

692. The activity of the poison of the viper, and indeed of all serpents, depends upon a variety of circumstances. When long confined, or after the animal has bitten frequently in rapid succession, and during cold seasons, when it loses its activity, the poison also loses its virulence more or less, owing either to a scantier, or a weaker, or an exhausted secretion. Serpents are most poisonous in warm, humid, and malarious climates, and are there most numerous. In those parts of Africa, which were chiefly of this description that I visited, accidents from them were very frequent; but, owing to my residence at any place being short, I did not succeed in obtaining any of the poisonous species. The most dangerous bites are inflicted on naked, or imperfectly covered parts, particularly the extremities; and the more severe and virulent, the more rapidly are the symptoms developed. The poisonous properties of the fluid contained in the reservoir do not cease with the animal's life; but may continue, like some other poisonous fluids, as that of small-pox, &c., even when the fluid is dried and kept for some time. Professor MANGILI has demonstrated that it may be swallowed without injury. The *Fetish-men*, or native doctors in Africa, have in my presence, when sucking the

wounds made by a poisonous serpent, swallowed the fluids thus drawn from the wound to show their powers and invulnerability.

693. The *Crotalus horridus*, or *rattlesnake*, produces effects which vary with the circumstances noticed above. Sir E. HOME states, that when the poison of this reptile is active, its local operation is so sudden and violent, and its effects upon the frame so great, that death soon takes place; and that, on examination after death, the only alteration of structure is in the parts close to the bite, where the cellular membrane is completely destroyed, "and the neighbouring muscles are very considerably inflamed." But I can add, that the appearances of the muscles which are assumed as inflammatory are not actually such; but those of congestion and softening from loss of the vital and physical cohesion of the tissues.

694. When the poison is less virulent, the shock to the frame is rarely fatal. The pain in the part bitten is very severe, and in about half an hour swelling takes place from the effusion of serum into the cellular tissue, and continues to increase more or less rapidly for about ten or twelve hours, extending during that period to a greater distance from the wound. The blood afterwards ceases to circulate in the smaller vessels of the swollen parts; the skin over them becomes quite cold; the action of the heart is so weak that the pulse is scarcely perceptible; a slight delirium is present, and the stomach is so irritable that nothing is retained on it. If the patient does not sink, these symptoms disappear in about sixty-hours, and inflammation and suppuration take place in the injured parts, and when these are great the result is often fatal. The symptoms of those who recover go off more readily and completely than the symptoms produced by a morbid poison which has been received into the system. When the bite is in the fingers or toes, the part often immediately mortifies; and when death takes place in these cases, the absorbent vessels and glands present no change, nor has any part lost its natural appearance excepting those in the vicinity of the wound. The following cases illustrate the symptoms and morbid changes produced by this poison.

695. A person who took rattlesnakes from America to Europe for exhibition was bitten by one in Paris, and died in nine hours. On *dissection*, all the internal organs were found healthy, "excepting that the membranes covering the brain and spinal cord had a reddish tinge, and the venous blood on the affected side was curdled or clotted." (*Edin. Journ. of Science*, vii. 86.) — Dr. HORNER states that a patient, whom he saw some hours after having been bitten in the arm by a rattlesnake, had the arm from the thorax to the fingers swollen to twice its natural size, and it was very painful when moved. The pulse was almost imperceptible; the extremities were cold; the eyes were muddy and heavy; the face bloated. Death took place twenty-four hours after the receipt of the injury, and *five hours* after death the body was examined. The face was then much bloated; the neck tumid and purple; the bitten arm was still swollen and purplish. The internal organs presented no lesion beyond congestion, which was most apparent in the vessels within the cranium and spinal canal. The cellular and adipose tissues of the injured arm were infiltrated with serum. The blood was fluid, and of a very dark colour. (*American Journ. of Med. Sciences*, vol. viii. p. 397.)

696. A man was bitten in London by a rattlesnake which was being exhibited. In less than half-an-hour the injured hand began to swell, and pain and swelling extended rapidly along the arm to the axilla. In two hours afterwards the man's answers were incoherent, his skin cold, his pulse 100 in a minute, and he was sick at stomach. In eight hours the pain was extremely violent, the swelling very great, and he had frequent attacks of faintness. The following morning his pulse was remarkably feeble, 132 in a minute, and slight swelling had extended from the arm along that side to the loins, with a mottled appearance from the exudation of blood under the skin. His whole arm was very cold and painful, presented several vesications, and "had a livid appearance, similar to what is met with in the dead body after putrefaction has commenced." On the third day his pulse was scarcely perceptible; the extremities were cold, and the vesications were larger. He rallied for a few days, but gangrene of the arm took place, and he died on the eighteenth day. Sir E. HOME, who records this case, adds, that Dr. RUSSELL communicated to him the details of a case of a man who had been bitten by the *cobra di Capello*, and the symptoms were nearly the same as now stated. He also refers to two experiments he made on a couple of rats, which he caused to be bitten by a venomous serpent. The one first bitten died in one minute after the bite; and upon dissection he found the cellular tissue under the skin of the side bitten entirely destroyed. The second rat was not so rapidly nor so severely affected, but it died in six hours. — (*Philosoph. Trans.* 1810.)

697. The *Coluber fulvus Australicus*, or "*Copper-coloured Snake*," has sometimes caused death or dangerous effects in Australia, where it and other allied species abound. In a case detailed by Mr. BLAND (*Lancet*, Jan. 1848), the bite nearly proved fatal, although ligatures were instantly placed upon the limb above the injury. The *symptoms* were pain in the region of the heart, with a feeling of constriction in the chest; acceleration of pulse; giddiness, jactitation, dimness of sight, and general distress, which continued for some time; but were ultimately removed by the very judicious and active treatment adopted.

698. *B. Treatment.* — When the situation of the bite allows of the application of a ligature above it, then this practice should be instantly adopted; and even two ligatures ought to be applied, especially if a considerable time is likely to elapse before professional aid can be obtained. When the situation of the injury admits not of the application of a ligature above it, then a cupping-glass, or any vessel or cup which may be applied with sufficient exhaustion of the contained air to produce pressure around the bite, as well as to draw the fluids through it, should be resorted to and kept applied, or re-applied, as efficiently as possible. When medical or surgical aid is obtained, *excision* of the bitten part, if the situation admit of its performance, should be adopted, especially if the symptoms are urgent and the local contamination manifest. But when these means cannot be resorted to, and even when they have been already employed, *suction* of the wound should be as instantly instituted as possible, and continued with-

out intermission for a considerable time. The moderns have certainly not materially improved upon the treatment recommended by the ancients for the bites of serpents and other reptiles. If we refer to NICANDER, DIOSCORIDES, CELSUS, and other Greek and Roman writers, as well as to the Arabians, we shall find them all recommending the means now advised, with several others. Mr. ADAMS, in his most valuable translation of PAULUS ÆGINETA, has given an excellent epitome of the treatment prescribed by the ancients for poisonous bites and wounds. They all recommend ligatures, cupping, suction, and, in urgent cases, excision or amputation. After sucking and cupping the wound, they advise stimulating dressings; and the application of the flesh of fowls, whilst still warm, to the part. They also recommend bleeding "when the poison is distributed over the body;" but at the same time they give wine and stimulants, emetics, and sudorifics; and agree in GALEN's eulogy upon the virtues of the theriaca. I must, however, refer the reader to Mr. ADAMS's work, for a very full account of the practice of the ancients in these and in all other cases of poisoning.

698*. In Mr. BLAND's case (§ 697.), bleeding from the arm to the extent of sixteen ounces was adopted "in conformity with his experience in these cases, and was followed almost immediately by the entire removal of both the pain and constriction." At ten the same evening the patient was again bled to ten ounces, some pain and constriction in the chest having returned. Besides the means already mentioned, Mr. BLAND advises "the exhibition of stimulants, as oil of turpentine, aromatic spirit of ammonia, brandy or other spirits, eau-de-luce, port, sherry, champagne, or other wines." In addition to these, the head and face should be frequently sponged with cold fluids, as vinegar, rose-water, &c. I have seen, in Africa, where accidents from poisonous serpents are not infrequent, the juice of the citron with capsicum added to the other stimulants which were taken, and applied to the wound after suction had been continued for some time. The bowels were opened by means of olive-oil, taken by the mouth with stimulants, or administered as enemata with capsicum and salt. In the more intense states of poisoning by venomous snakes, bleeding can hardly be resorted to, owing to the extreme depression of the powers of life; and it is only when re-action is being developed by the aid of powerful stimulants, that the loss of blood tends to relieve the vascular congestion produced by the poison, especially of the lungs and large vessels, and, by reducing the mass to the low amount of moving power, thereby to restore and equalise the circulation.

699. Various substances have been recommended as *antidotes* to the poison of serpents. HUMBOLDT and BONPLAND mention a New Granada plant, the *guaco*, *Mikiana guaco*, the juice of which is said to deter snakes from biting persons on whom it is applied; the leaves being also applied to the wound to prevent the usual effects when a person is bitten. (ORFILA, *Toxicologie*, t. ii. p. 441.) *Arsenite of potash*, and other preparations of arsenic, as the Pill of Tanjore, have been used in the East as an antidote to this poison. Dr. RUSSEL states that it was taken sometimes with success, but that it failed in other cases. Mr. IRELAND (*Trans. of Med. and Chirurg. Society*, vol. ii. p. 397.) and Dr. PHILLIPS (*American Journ. of Med. Sciences*, vol. viii. p. 540.) have furnished satisfactory evidence of the efficacy of arsenic, even in the worst cases of poisoning by the bites of serpents. Mr. IRELAND relates five cases in which he prescribed the arsenic in very large doses. He states, that upon his arrival at St. Lucia, where venomous serpents are numerous, chiefly the *Coluber carinatus*, an officer and several men of the 68th regiment had died within a few months from bites of these reptiles; and notwithstanding the treatment, the patients had sunk in six to twelve hours from the time of their receiving the wound. The following case will show the symptoms and treatment of it and all the others: —

700. A soldier was bitten in the hand, the middle finger being much lacerated, and it was immediately amputated at the joint with the metacarpal bone. He was seen ten minutes after he received the wound. He was then so torpid and senseless, as to feel little or no pain during the operation. The hand, arm, and breast of the same side were much swollen, mottled, and of a dark purple and livid colour. He was vomiting, and appeared as if intoxicated. Pulse, quick and hard. The wound being dressed, a cathartic clyster and the following were administered immediately: — "℞. Liq. Arsenicalis ʒii. Tinct. Opii, gtt. x. Aquæ Menthæ pip. ℥iss." This medicine was added to half an ounce of lime juice, and taken immediately. It remained on his stomach, "and was repeated every half hour for four successive hours. In the mean time the parts were frequently fomented with common fomentation, and rubbed with a liniment composed of Ol. Terebinth. ℥ss. Liq. Ammon. ʒss. and Olei Olivæ ℥iss. The cathartic clyster was repeated twice, when the patient began to be purged; the arsenical medicine was now discontinued." From that time he gradually recovered. The next day he appeared very weak and fatigued; the swelling gradually diminished, and he soon recovered and returned to his duty.

701. The administration of large doses of *ammonia* and *eau-de-luce* has been advocated by many, and numerous instances of their success have been recorded, whilst HOME and ORFILA doubt their virtues. They are, however, useful in rallying the powers of life, and in promoting perspiration. And in this way other stimulants, as alcoholic fluids in large doses, have also been of use. Many plants have likewise been much praised as antidotes to the bites of serpents, especially the *Aristolochia serpentaria*, the *Prenanthes alba* and *altissima*, the *Polygala senega*, the *Eupatorium ayapana*, the *Ophioxylon serpentinum*, *Nux vomica*, &c.; but probably they possess no further specific influence than in enabling, by their stimulating action, the vital powers to resist the injurious influence of the poison.

702. ii. VARIOUS INSECTS AND REPTILES, especially the *scorpion*, the *tarantula*, the *hornet*, the *spider*, the *wasp*, and the *bee*, produce serious effects in some constitutions by their stings. The effects of these, however, vary much. In some they resemble those produced by the bite of a viper; in others they are more slight, and are merely irritant locally, whilst they occasion more or less severe nervous symptoms. — *A.* The sting of the *scorpion* has, in some instances, produced severe diffusive local inflammation, with pain, fever, tremor, and depression. Dr. GRAPERON saw two

cases in which the sting of the *tarantula* proved fatal in the Crimea—one in forty-eight hours, the other in six days. The sting, which was inflicted in the patient's neck, was very painful, and had left a brownish violet mark. The neck, head, and shoulders were swollen; the thorax from the clavicle to the false ribs was of a bluish colour; and respiration became difficult forty-four hours after the injury. Scarifications, the actual cautery, oil externally and internally, and ammonia, were all employed in vain.—(*Quart. Journ. of For. Med.* i. p. 215.)

703. *B.* Dr. BECK refers to a case in which the sting of a *bee* caused vomiting, fainting, sweating, trembling, and great difficulty of breathing; and the sting of the *wasp* has caused similar effects, and sometimes even insensibility with spasmodic twitchings. Dr. BECK refers in a note to a statement that Dr. KING, of Stratford-on-AVON, died on the 14th June, 1833, in consequence of a sting which he received on the 8th of the same month from a *hornet*.

704. *C.* The *treatment* of the stings of these insects should be the same in principle as that advised for the bites of venomous reptiles; which is similar to that prescribed by the ancients, an epitome of which will be found in Mr. ADAMS's work, already referred to. In the less severe cases, emollient and anodyne applications to the wound are of use, after the sting is extracted; and the volatile alkali, or the other stimulants and restoratives mentioned above, should be given internally in large and repeated doses, when vital depression is alarming, or the other general symptoms are severe.

☞ In this article it will be seen that I have ventured upon a different CLASSIFICATION of poisons than has hitherto been proposed; and that I have based this classification upon what I believe to be the operation of such substances as have been found to be more or less injurious to the living human body. It may be some reason for this arrangement, that there is scarcely a poison which is not, or has not been, employed as a medicine, and therefore some reference should be had, in our consideration of the *modus operandi* of poisons, to the nature and effect of these substances when employed medicinally; and, in fact, it is upon what is known, and upon what I believe, to be the influence and action of these substances that I have founded my *arrangement*. I offer it to the examination of the closely observing and profound pathologist, therapeutist, and medical jurist; and to several such I have been much indebted in the preceding pages. There are numerous substances, both medicinal and poisonous, which are arranged with great difficulty according to their operation and more prominent effects, owing to the circumstance of their operation taking place through different media and channels; and to the fact that the effects upon the different vital organs vary in different persons, from causes already stated, and even in the same person at different times, seasons, and states of the digestive organs, and of the economy. Hence substances which may appear to some to belong to a certain class, may seem with equal justice to others to belong to a different class. But this objection is one to which all arrangements are liable, where the objects to be arranged present not sufficiently distinctive characters on which specific differences may be based. There may be some imperfections in my views, and I may have to modify certain of them, especially as respects those substances the nature of which has been insufficiently investigated; but I have endeavoured to be as precise and correct as the extensive range of the subject and my limited powers allowed me to be; and I have endeavoured to do justice to all who have furnished me with information in their able and classical productions.

The reasons for my excluding chemical and juridical disquisitions from my treatise have already been given; but I may again state that they are not comprised by the scope of my work, or by its limits; and I am desirous that they should be referred to in the practical and able sources which I have already indicated. My object—and, indeed, my duty—was to describe the *operation*, the *effects*, the *diagnosis*, and the *treatment of poisons*, as a *most important part of Practical Medicine*,—as, in truth, *states of disease*, although produced by art, or with the intention of destroying life,—as no mean or small part of *medical practice and usefulness*,—and as contributing in no small degree to the medical practitioner's knowledge, not only of the sources and course of the most intense and rapid states of morbid action and of their results, but also of the operation and effects of our chief medicinal agents in alleviating and in removing spontaneous or natural maladies.

In order to facilitate reference to the PRINCIPAL TOPICS and to the INDIVIDUAL SUBSTANCES comprised in the article POISONS, I add the following synopsis, with the *number of the paragraph* at which the consideration of them commences.

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POLLUTION. — SYNON. — *Pollutions* (Pollutio — the act of polluting or defiling, corrupting or tainting); *Spermatorrhœa*; *Gonorrhœa vera*, *G. libidinosa*; *Anaplasmus*, *Manustupratio*, *Masturbatio*; *Onanismus*; *Tabes dorsalis*, *Profluvium seminis*, Auct. Var.; — *Samenfluss*, *Onanie*, *Selbstbeflekung*, Germ.; — *Incontinence de Sperme*, *pertes seminales*, *Onanisme*, *Spermatorrhée*, Fr.; — *Pollutions*, *voluntary and involuntary*; — *Self-pollutions*.

CLASSIF. — GENERAL PATHOLOGY — *Ætiology*. — SPECIAL PATHOLOGY.

1. DEFIN. — *Voluntary and solitary excitement of the sexual organs, occasioning emissions or the venereal orgasm* (self-pollution — voluntary pollution): — *Discharge of the seminal fluid, with or without the venereal orgasm, involuntarily or during sleep* (involuntary pollutions).

2. Under the designations, *voluntary and involuntary pollutions*, I propose briefly to consider those moral and physical disorders which have been variously denominated according to the forms in which they have been presented to the medical adviser, or which they have assumed in the progress of moral depravity; not infrequently in connection with outward moral observances and hypocritical sanctity. That form of pollution, in either sex, which was at first voluntary, generally becomes involuntary when the evil habit is persisted in, although the latter, in certain circumstances, may occur primarily. It becomes, therefore, necessary to consider the different states of this important disorder in succession, inasmuch as the moral vice is generally the cause of the physical disease. Both states of the disorder should be viewed with a due regard to their special relations and consequences; for so remarkably important are these consequences — so numerous are the ills, both of body and mind, which this disorder induces — and so certainly are those ills entailed upon the subsequent life of the person who is its subject, and upon his offspring to the third and fourth generation, if, indeed, he possess the power of propagating his species, even in the most imbecile forms, that it becomes the duty of the medical instructor to point out its forms, relations, and consequences. The subject has been improperly neglected by both instructed writers and scientific physicians, because it is one frequently involving indelicate ideas, and requiring unpleasant revelations — as the due consideration of it unveils the innate and concealed depravity of our nature. But the vice, the moral depravity, of which the disorder at first consists, soon creates for itself, in actual and often incurable physical disease, a necessity for disclosure — a necessity which is not confined to the person concerned, but extended to his family and his offspring. This being the case with disorders and their usual consequences, which involve so extensive and important considerations, should they be relinquished by the only persons who are able to investigate them aright, and to restore the mental and the physical imperfections upon which they depend, and be handed over to ignorant harpies, who prey upon the wretched sufferers, who take the utmost advantage of the fears which torment them, of the moral and physical debility which sinks them, and of the circumstances in which they are involved, to deceive, to plunder, and to swindle them, and who have neither the knowledge, nor the ability, nor even the intention, to render them any aid?

I. SELF-POLLUTION — VOLUNTARY POLLUTION. — SYNON. — *Masturbation* — *Manustupration* — *Onanism*, *&c.*

CLASSIF. — GENERAL PATHOLOGY — *Ætiology*. — *Pathogeny*.

SPECIAL PATHOLOGY.

I. CLASS. II. ORDER (*Author*).

3. i. OCCASIONS, CAUSES, &c. — I have already noticed, in a few sentences, the consequences of the too early and inordinate excitement of the genital organs in both sexes (see art. DISEASE, § 53.); but the real importance of the subject induced me to mention merely certain prominent matters, and to reserve the fuller consideration of it to a more appropriate place. Self-pollution is generally a vice of *puberty*, but it frequently is often practised at the earliest appearance of this epoch; and, in females, even long before the usual accession of this change. In both sexes, the habit is not infrequently continued through a considerable portion of after life. Several writers whose works I have perused have stated that they have known instances where this vice had commenced in females as early as three or four years of age; and cases of it have come before me when this age was hardly passed. At this early age, the practice has generally been acquired from the girls to whom the care of children has been committed. In a case of nymphomania, in a patient to whom I was called in consultation, and who was sixteen years of age, the intelligent mother, the wife of an eminent physician in India, stated that the disease originated in manustupration acquired from a native Indian nurse, when

the child was only four years old. It is difficult to determine how early in life this vice may commence in the *male sex*. A patient who lately consulted me respecting his presumed impotence, stated that he commenced this vicious practice as early as eleven years of age; and I find upon referring to my African memoranda, that it is common among negro boys of nine and ten years of age. But in this country, from thirteen years of age to twenty-five, and even upwards, is the period in which it is commonly indulged in; although its evil consequences are often found out before or soon after this latter age. At whatever period commenced, the habit is carefully concealed from parents and others; and is often not detected, nor even suspected, although both mind and body are reduced by it to the lowest state of imbecility.

4. It is requisite to be aware of the early *age* at which this vice may commence, as well as of the *circumstances* in which it commonly originates. One chief occasion of its early appearance has already been noticed; and this should suggest precautions, especially as respects the persons with whom children are allowed to sleep or to associate. Boarding-schools and other seminaries or institutions, where a number of children or young persons are brought together, and especially where several sleep in the same apartment, or more than one in the same bed, are the places where this vice is most frequently acquired, by both sexes; but it is not infrequently practised by those who have never entered these places, it being either suggested by the local irritation and physical excitement often present during early puberty, or soon after this epoch, or acquired from tutors and governesses. The neglect of *circumcision* in Christian countries is certainly no mean physical cause of the prevalence of this vice, and of many of the consequences which follow. The institution of this rite for the descendants of Abraham, and the faithful observance of it to the present day not only by them, but also by the followers of Mahomet, have tended, amidst numerous countervailing influences and persecutions, to perpetuate an enduring and healthy race; the beneficial results of circumcision being experienced not only by the individual himself, but also by his offspring, and even indirectly by the female sex, as may be inferred from various physiological considerations.

5. Although this vice is most prevalent amongst young persons, its ill effects generally becoming apparent to them with riper years, yet it is not infrequently indulged in, by persons of both sexes, during advancing years; and is generally the cause of most of the complaints observed in unmarried persons after the age of twenty-five years, as well as sometimes before that period. It is certainly the chief cause of the lives of this class of persons being of much less mean duration than those of the married.

6. There are few causes of this disorder more influential than idleness — than the want of such occupations for youth as require early rising. A full and active occupation of the mind generally shuts out all ideas which suggest this mischief, whilst the pleasures, in which idleness favours the indulgence, tend to encourage those ideas. Lying in bed after being awake is another occasion of no small importance — of much greater than is generally attached to it. Although this and several others of the foregoing causes, may not have first occasioned this vice, still they remarkably favour a frequent recurrence to it, and often render the morbid impulse to it too strong for the self-control of the person who has fallen into the evil habit.

7. ii. THE SYMPTOMS AND SIGNS of Masturbation are in some cases obvious, almost on the first glance; in others, they require close observation, aided by experience of the several phases they assume. When the mischief has not been long indulged in, then the injury sustained by the organisation is seldom such as to be manifest. But when it is commenced at an early period of puberty, or with the first indications of puberty, then its injurious effects show themselves much sooner than when the frame has previously been fully developed; and are much greater, especially at this early age, than the due congress of the opposite sexes. That the injury done to the constitution by this vice is always much greater than that caused by sexual intercourse is certainly the case, although the act may not be oftener repeated in the former, than in the natural way. As respects the female sex, this result may be easily accounted for; but it also obtains, and may be explained, as respects the male sex; for, independently of its being an act opposed to the dictates of nature and religion, it is one which exhausts the nervous powers more completely than the orgasm consequent upon reciprocal enjoyment, and the interchange of nervous emanations. But, it should be recollected that self-pollution is often commenced at an earlier or more immature age, than that at which the intercourse of the sexes can take place, in the usual states of civilised society; and that hence it is the more injurious, because it impairs or interrupts the due development of both mind and body, at a period when such development receives, in the healthy frame, its chief impetus and full consummation from the genital organs and secretions. There can be no doubt, however, that the individual who has once devoted himself to this Moloch of the species, becomes but too frequently its slave to an almost incredible degree. A patient who was sent to London for my advice, confessed that he had practised this vice seven or eight times daily from the age of thirteen until twenty-four; and he was then reduced to the lowest state of mental weakness, associated with various bodily infirmities — indeed, both mental power and physical existence were nearly extinguished.

8. *a*. The more prominent symptoms of self-pollution are readily recognised; but those which indicate an early stage of the habit are less manifest. In females, who often commence it long before, or with the earliest appearance of, puberty it is indicated chiefly by pallor or loss of colour, a desire to be alone, a somewhat dejected manner, listlessness and indolence, a desire to go soon to bed, and to lie long after having been awake; a darker mark than usual under the eyes, or of the lower eyelids; a near or weak sight; slight emaciation, although the appetite is good or even ravenous; the habit of biting the nails, which are generally very short; warts on the first or second fingers, slight sores about the roots of the nails, &c., are signs often observed,

and when several of them exist in the same case, suspicion of self-pollution may be entertained; and may be viewed as confirmed, if slight leucorrhœa, with redness and considerable development of the clitoris and nymphæ be present, and especially if the linen or sheets betray any marks or stains. Several of these symptoms may be observed in males; but the night-linens most commonly demonstrate this vice in them. They, however, often prevent it from being thus detected, and completely conceal it until their appearance sufficiently betrays them.

9. When self-pollution is not frequently practised it may be very long before it is detected — if detected at all: but, when it is a frequent habit, the above symptoms then are not of long duration without being followed by others, which more decidedly indicate the mischief. The signs, however, vary with the age. When early practised, or before the frame is developed, or whilst the frame is in course of development, this process is more or less impaired, or even interrupted. The organic nervous influence and vital power are determined chiefly to the immature sexual organs, and all the other vital manifestations languish more or less. The functions of digestion and assimilation are weakened, the blood is poor and deficient in red-globules and hæmatosin, and a state of anæmia is more or less completely produced. The muscles become flaccid; and the tendons, ligaments, and capsules relaxed and easily stretched. The nervous systems are weak, susceptible, readily excited or depressed, and ultimately betray further disorder. Hence arise weakness of the joints, flexures of the spinal column, chlorosis, chorea, epilepsy, rheumatic or neuralgic pains, nervous headaches, and a general blight of the constitution, often associated with worms in the intestinal canal, and always attended by mental and bodily indolence, chilliness and susceptibility of cold, and by incapability of intellectual and physical occupation. At this early age, or when puberty is either not commenced or is just appearing, the patient is often stunted in growth by this habit, or is rendered decrepit and imbecile, the ovaria and the testes are imperfectly developed, and even waste more or less; and the beard in males hardly appears. I was first consulted by the parents of a young lady when she was about twelve years of age. She was then suffering from debility and slight anæmia; and subsequently she was the subject of chlorosis and tubercular consumption, of which she died about the age of twenty. She had never menstruated. When the body was examined after death, the ovaria were remarkably small and changed to a dense fibro-cartilaginous state. It was ascertained during my attendance, that she had become early addicted to masturbation; she ceased to grow at an early age; and was of a small and weak conformation — although her parents were large and strong persons. Most of those who thus early become addicted to self-pollution, are soon afterwards the subjects, not merely of one or more of the ailments already noticed, but also of enlargements of the lymphatic and other glands, ultimately of tubercular deposits in the lungs and other viscera, or of scrofulous disease of the vertebræ or bones, or of other structures, more especially of the joints.

10. *b.* When self-pollution is commenced at a more mature age, or when puberty is advanced or completed, the mischief which the constitution sustains is not so remarkable, nor so rapid in its progress, as when practised earlier; for the frame is then further developed, and more consolidated; and the powers of life furnish a greater resistance to the evil. Nevertheless, the consequences are generally most serious, especially when the vice is often indulged in; and, in some respects are similar to those already mentioned, whilst those most frequently observed at this more mature age, are not unfrequently seen also in younger persons. Stooping and roundness of the shoulders, with a falling inwards of the thorax below the clavicles; emaciation and weakness of the joints; pallor of the countenance, with sunk orbits, the eyes being surrounded by a darker circle; a weak or dim sight, or nearness of the sight, weakness and pains in the eyes often preceding the change in the focus of distinct vision; eruptions on the face; a falling out of the hair, and baldness of the crown and forehead; pains in the head, lowness of spirits, and aching of the back and loins, with inability of sustaining long an erect or even a sitting posture without support; marked aversion from leaving bed in the morning, and indisposition to enter upon any mental or bodily occupation, are the earliest indications of self-pollution, at the more mature periods of life. To these succeed, sooner or later, loss of colour, a pallid state of the gums, tongue, and prolabia; sometimes a dusky hue of the countenance, with sores of the face, which are frequently picked and irritated by the patient; leucorrhœa and delayed, or suppressed, or interrupted, or painful and difficult, or scanty menstruation; in some females protracted or frequently recurring catamenia; numerous hysterical symptoms, often irregular or anomalous, and attended by painful, or spasmodic, or slightly paralytic symptoms, and with all the phenomena noticed when treating of HYSTERIA and SPINAL IRRITATION. Ultimately, all the bodily functions betray increasing disorder; and special forms of disease succeed, particularly epilepsy, glandular and tubercular maladies, phthisis; palpitations of the heart from the slightest mental and physical causes, often protracted and excessive, and not unfrequently followed by organic changes of the parietes of the cavities, or of the orifices and valves of the heart; morbid states of the urinary functions and passages; hypochondriasis, and a morbid concentration of the attention upon the various changes and states of sensibility or of disorder, thereby aggravating these forms; melancholia attended by various delusions, by unfounded fears, and a state of mental misery; and, at last, complete prostration of the powers of both mind and body, in various forms of partial or general insanity, or of incomplete or complete palsy; this latter affection often commencing as partial paraplegia, and advancing to incomplete general palsy of motion, the movements resembling those of chorea, and ultimately terminating in complete general palsy, with marked disorder of the urinary secretion and excretion.

11. *c.* During the progress of the ills which self-pollution entails, the digestive and the assimilating functions suffer more or less; the amount of disorder which these betray, varying with the advantages enjoyed as respects food, air, exercise,

and sleeping arrangements. But, generally, these functions and nutrition languish remarkably; and the bowels become habitually, sometimes obstinately, costive. Amongst the most certain signs of self-pollution, especially in males, is premature baldness; but it should be admitted that it not unfrequently is also produced by low fevers as well as by venereal excesses. Abuses of the sexual organs are soon followed, not only by one or more of the maladies enumerated and by constitutional exhaustion, but also by more or less disorder and debility of these organs themselves, frequently amounting to temporary impotence and sterility. The frequent and unnatural excitement of these organs occasions an increased secretion of the prostatic fluid, and often, also, acute or chronic inflammation and enlargement of the prostate gland, and all the usual consequences; increased susceptibility and impaired or exhausted function of the virile organs; irritation of the seminal passages, and ultimately involuntary emissions, and wasting of the testes.

12. *d.* The mischief is seldom so rapidly manifested in the female as in the male; unless the practice commence before the full evolution of puberty. After this period, however, the evils which result depend much upon the frequency of the habit; but these vary accordingly, the state of the constitution, temperament, and predisposition, also, modifying the effects. These effects have already been enumerated; but they either cause, or are connected with sterility, which is generally owing to the changes produced in the ovaria by excessive, frequent, and unnatural excitement, and sometimes, also, in the uterus and Fallopian tubes. Independently of changes in the ovaria and tubes, and often antecedent to these, leucorrhœa is frequently present, and is sometimes followed by ulcerations of the os uteri, and numerous sympathetic ills which this state, in connection with irritation of the ovaria and uterus, generally entails. The occurrence of ulceration, and the aggravation of it, are remarkably favoured by the means too frequently and officiously resorted to in ascertaining the nature of the uterine disorder; for, by these means, the access of air to the seat of irritation, oftener increases the mischief than the remedies prescribed tend to allay it.

13. *e.* The *evil consequences* of self-pollution are, however, not confined to the individual; but, as already stated, *are transmitted to the offspring*, when the effects have not been such, as to kind and degree, as to prevent procreation. But when the constitutional powers, and more especially the sexual organs, of either sex are much weakened by this vice, either sterility is the consequence, or the offspring is delicate, puny, decrepit, or the subject of various congenital maladies, especially of the nervous system — to idiotcy from deficient development of the brain, to hydrocephalus, to epilepsy, convulsions, palsy. The scrofulous diathesis, tubercular and glandular maladies, diseases of the vertebræ and of the joints, hydrocephalus, softening of the central portions of the brain, and tubercular formations in the membranes, palsy and convulsions, chorea, inflammations of the membranes or substance of the brain or of the spinal cord, and numerous other affections to which delicate infants and children are liable, very commonly result from self-pollution having been practised by either of the parents, previously to the married state. But the evil does not always stop at this epoch of existence; it often extends throughout the life of the offspring; or it appears only with puberty and mature age. The several diseases actually proceeding from tubercular deposits; insanity, or mental weakness, or imbecility; pulmonary consumption, chronic debility, or faulty or impaired development of the frame; diseases of the spine and joints; hysterical and neuralgic affections, epilepsy, and irregular forms of convulsion, partial or complete states of palsy, and various other affections, not unfrequently appear, in consequence of the constitutional predisposition arising from the vice of the parent, and the faulty development and impaired nervous energy of the offspring.

II. Involuntary Pollutions. — Synon. — *Involuntary discharges of spermatic fluid.* — *Spermatorrhœa.* — *Involuntary seminal discharges.*

14. *A.* This form of pollution is of very frequent occurrence, and generally follows the foregoing. When self-pollution has been practised at an early age, or so frequently as to induce debility, or an irritable state of the sexual organs, involuntary discharges of spermatic fluid are often—indeed generally—the consequences of the relinquishment, or even of a temporary cessation of the voluntary acts. It has been believed, since the appearance of M. Lallemand's work on this disease, and of Mr. B. Phillips's excellent papers on the same subject, that these discharges "are for the most part, if not altogether, caused by irritation set up in or about the ducts connected with the testicle," especially at the termination of the seminal ducts in the urethra. Such is, doubtless, the case in many instances; but it is much more generally only a part of the mischief; the whole genital apparatus, more particularly the seminal ducts and vesicles, the ejaculator muscles and the prostate gland, having acquired, from the *vicious practice* above exposed, an irritability and susceptibility beyond the control of the individual. *This practice is the chief cause* of this morbid condition — of this often serious disease, which, if not corrected, generally induces other maladies, although when it is only of occasional occurrence in robust persons, it is sometimes productive of little injury. Yet self-pollution is not the only cause. The next to it in importance are excesses in sexual intercourse; the constant excitement of the sexual organs ending in a morbid susceptibility, debility, and irritability of the whole sexual apparatus, manifested especially by the parts just named. Gonorrhœa, gleets, discharges, and strictures of the urethra are also, although much more rarely, concerned in the production of this disorder. The irritation of ascarides in the rectum, of hæmorrhoids, of fissures of the anus, &c. has also been considered as one of the causes of these discharges; but I suspect that these morbid states are more frequently associated effects of the same causes, —of masturbation and sexual excesses,— than the actual occasion of the seminal emissions, even in those cases in which they co-exist. However, whether the irritation of the rectum be a cause or a complication of the disorder now being considered, is practically of the less importance, that in either case it equally requires to be removed by suitable treatment.

15. *B. The evidence of involuntary spermatic*

discharges is, as Mr. PHILLIPS correctly remarks, sufficiently clear; but ultimately, and as the weakness of the organs increases, the ejaculation is unattended by the usual sensations, and the patient may then be unaware of the extent of the evil. It is not unusual, in such far-advanced cases, to find the spermatic fluid passed with the urine, or during efforts at stool, especially when the bowels are costive. In the latter circumstances, the fluid is squeezed out by the pressure on the seminal vesicles. The patient is, however, generally aware of the evil, when the fluid is passed with the urine; because it almost always passes with the last drops, and can then be detected, and is attended by a certain sensation about the neck of the bladder. When the urine is examined soon after it is passed, small granular diaphanous particles are found floating in it, or at the bottom of the vessel. Mr. PHILLIPS states, that when the evil is far advanced, no peculiar sensation is experienced, and the granular matter may be undetected, or may assume a more uniform cloudy appearance. The microscope most certainly detects the seminal fluid in the urine; for by its means the spermatic animalcules may be perceived in the deposit or cloudy portion of the urine. As debility of the constitution or of the sexual organs increases, owing to the great frequency of the discharges, or to other causes, "the fluid becomes thinner, and the animalcules much less numerous, and they may be almost if not altogether wanting."

16. C. *The general symptoms or consequences* of involuntary pollutions are necessarily, in most respects, the same as I have above stated with reference to self-pollution, for as the involuntary is generally caused by, or is a sequela of, the voluntary discharges, the results, as respect both mind and body, will generally be the same. One of the most distressing of these to the mind of the patient is a state approaching, if not actually amounting to impotency. In some cases, the impotency is owing more to the fears and anxieties of the sufferer, than to the physical state of the organs. Mr. PHILLIPS has described this complaint so well, that I shall adopt nearly his own words. It is not that the seminal fluid is deteriorated, or incapable of determining fœcundation, but it is that the organs are wanting in the energy necessary for projecting the fluid into the vagina; erection, if it exists at all, being momentary. The digestive functions become deranged, the bowels constipated, nutrition languishes, respiration is troubled, the voice fails, the heart's action is interfered with, even to such an extent as to induce belief of actual disease of that organ, and hypochondriasis becomes complete. These symptoms do not advance far without causing disorder of the nervous system, especially weakness, or failure of one or more of the senses; headach, with a sense of weight or pressure, loss of memory, timidity, apprehension, and various other affections and diseases, either similar to, or identical with, those already mentioned (§§ 9 *et seq.*).

17. But the impotency which distresses the patient is not so often imaginary as it is real. The frequent seminal emissions are followed by a thinner and less fully elaborated secretion, with a morbidly increased prostatic fluid; and the imperfect and momentary erections, and the rapid emissions, are insufficient to excite the female orgasm requisite to procreation in most cases, or at least to a healthy impregnation and offspring. The impotency, however, is not the only evil; for it soon becomes associated with others if the seminal discharges continue, most generally with epileptic or convulsive affections, with palsy, with pulmonary consumption, with mental delusions, or general insanity, with distaste of life, and thoughts of, or attempts at suicide, or with some other of the various maladies which I have already shown to follow frequent self-pollutions (§§ 9 *et seq.*).

18. III. TREATMENT. — i. *Of self-pollution.* — It is obvious, that treatment must necessarily fail, or at best only lessen the ill consequences, as long as this vice continues to be practised. It should, however, be recollected, that it is not only most necessary that this vice, in all its moral and physical consequences, ought to be exposed to the patient, and the entire relinquishment of it insisted upon, but that those who have, or ought to have, control over him or her, should ascertain whether, or not, the prohibition be strictly observed; for the control of reason generally becomes so weak in these persons, as to be quite insufficient to restrain those impulses which the occasions mentioned above (§§ 4—6.) too frequently favour or excite. It should not be overlooked that physical conditions and local irritations are often the causes of many of our most uncontrollable desires and passions; and that professional inquiries ought to be directed to the state of those organs, which, not only are influenced by these desires, but which instinctively excite the desires themselves, independently of reason and volition. There can be no doubt, as I have above stated, (§ 4.) that the occurrence of this vice is remarkably favoured by the physical condition of the male genitals, especially as regards the neglect of circumcision. I am convinced, that the abrogation of this rite among Christians has been injurious to them, in religious, in moral, in physical, and in sanitory and constitutional points of view, — that circumcision is a most salutary rite, as respects not only the individual, but also the female whom he marries, and his offspring. He who devotes himself to self-pollution — to this modern Moloch of the species, — should duly consider the severe denunciations and punishments which it provoked from the Jewish legislator, and observe its enervating effects upon himself, both mentally and bodily.

19. It is necessary, not only to procure a complete relinquishment of this vice, but also to restore the several functions — sexual, digestive and assimilative, nervous and mental — to their healthy conditions. As the manifestations of these several functions are more or less debilitated by this vice, the advice which I have given at full length in the article DEBILITY (§§ 29 *et seq.*) should be adopted and strictly followed in all its various details. Tonics, suited to the peculiarities of the case, ought to be prescribed, especially the chalybeate tonics and mineral waters; and these should be aided by residence in a healthy air, by regular exercise, by full occupation, and by early rising. The patient should get out of bed instantly upon awaking in the morning, and have recourse, either to a shower-bath, or to the cold douche, or to the affusion on the loins or genitals of sea-water, or water in which salt has been dissolved being preferred. He should sleep on a hair mat-

tress, and not be allowed a longer period than seven hours for repose. If he or she be much weakened, two or three hours rest on a sofa may be allowed in the middle of the day, but sleep ought not to be permitted, as it must be reserved until bed-time. The diet should be sufficiently nourishing without being heating or stimulating; and the amusements and the reading be such as will not excite sexual desires. The mind, as well as the body, ought to be fully, agreeably, and profitably occupied, without inducing more fatigue than will favour sound sleep during the hours devoted to repose.

20. During the course of this treatment, the digestive functions should be duly promoted and the bowels regulated. Costiveness will be best prevented by means of stomachic aperients, as the compound infusions of gentian and senna conjoined, taken either early in the morning or at bed-time; and the impaired tone of the sexual organs and nervous system will be the most certainly remedied by the tincture of the sesquichloride of iron, with tincture or infusion of calumba, &c.; or by the sulphates of iron and quinine with the compound galbanum pill, or a vegetable extract; or by the iodide of iron in the syrup of sarsaparilla, or by such other preparations of iron and their combinations as the peculiarities and complications of the case will suggest. In many instances, and more especially in those which manifest a tendency to pulmonary disease, to disordered action of the heart, or to nervous headaches and affections, the mistura ferri composita will prove an excellent remedy; and, if there be any tendency to glandular or tubercular disease, the liquor potassæ and tincture or extract of conium may be added, or the iodide of iron or the iodide of potassium may be substituted. When self-pollution has been early or long practised, the consequent states of anæmia and of nervous exhaustion require either an immediate recourse to chalybeates, or the adoption of them after vegetable bitters and tonics have been taken for a few days with alkaline carbonates, or with the mineral acids, according to the peculiarities of the case. — (*See further the Treatment advised in the Article* Debility, §§ 29 *et seq.*)

21. *B. Involuntary Pollutions*, or *Spermatorrhœa*, generally originating in self-pollution, or in venereal excesses, require the same means as have been just advised. But these may not suffice to prevent the occasional or even the frequent recurrence of involuntary pollutions; for, although the *voluntary* emissions are discontinued, the *involuntary* may replace them in some form or other. Lallemand, Phillips, and others, have shown that the passage of a bougie armed with lunar caustic, down to the seat of irritation, at or about the mouths of the seminal ducts, will remove this often distressing complaint. The application of the caustic is made by means of Lallemand's instrument, which conceals the caustic until it has arrived at the seat of pain, which is usually a little in front of the prostate, and a little more than six inches from the orifice of the urethra. When the instrument has reached this point, then the caustic is uncovered, and that portion of the urethra brushed over with it. As soon as this has been done, the caustic is again covered and the instrument is withdrawn. This application occasions little uneasiness; with slight smarting upon passing the urine, and a discharge, which is sometimes considerable, and at first is thin and watery, but gradually becomes thicker, and in the course of a few days ceases. A feeling of improvement is stated by Mr. Phillips to be early manifest in most instances, but the effect of the remedy cannot be estimated until the irritation has subsided. If by the end of six weeks, he remarks, from the application, a very decided amendment, or a cure, be not produced, it may be concluded, either that an insufficient application of the caustic has been made, or that the fatal habit of self-pollution is still persisted in. He has more than once applied too little, but he has never had to accuse himself of having applied too much. In any case a second application is indicated when the desired effect is not obtained from the first. He has never had occasion to make more than two applications, but circumstances might render a further recourse to the remedy proper.

22. If the affection have been caused by inflammation of the urethra — by gonorrhœa or by gleet, or if it be consequent upon stricture, it may cease upon the removal of the primary disease. But if this result be not procured, then Lallemand's treatment ought to be tried. When there is stricture then the mechanical obstacle ought to be removed before this treatment is employed; but the existence of gleet need not prevent its immediate adoption. Mr. Phillips states, that he has scarcely ever had recourse to a second application until five or six weeks have passed and given the assurance that the first has been insufficient. Of 109 cases, 84 were under twenty-two years of age; 97 admitted that they had practised masturbation, and they referred this complaint to that cause. Every one, however, asserted that the habit had been discontinued — by some for a few months, by others for years; but in many cases he suspected the accuracy of the assertion.

23. I have been consulted by a number of persons of various ages, from seventeen or eighteen up to between fifty and sixty, who have been subject to this complaint. The most common age was from twenty to thirty-five; but almost in every case abuse of the sexual organs was confessed. In several instances the patient was married, and, in the majority of these, there was no family. Some of the patients were widowers. One gentleman, aged about fifty, married, for ten or twelve years, to a young and healthy woman, and has had no family, was addicted to self-pollution when young; but being of a robust constitution, and indulging in field-sports, he did not appear to have suffered. When he consulted me, he was liable to frequent involuntary discharges, and sometimes to two in one night, even although he may have had intercourse with his wife soon after going to bed. This, and similar cases, have shown that marriage, which will prove a cure of the complaint in many instances, will not always prevent its occurrence, or remove it when it depends upon chronic irritation of the mouths of the seminal ducts, and upon congestion and enlargement of the prostate gland, these morbid conditions co-existing in that case, but that it may even induce this disorder, and associated disease of the prostate, if sexual intercourse be too frequently indulged in.

24. In young and otherwise healthy persons, when the complaint has not occasioned complete

impotency, although the patient may fear the existence of this state, or dread the accession of the loss of all sexual power, marriage will generally bring about the healthy state of the sexual organs, if they be very moderately and regularly exercised at the promptings of sincere affection in connection with sexual desire. But it is always preferable that the complaint should be removed before the married life is commenced; and it should be imperative, when impotency more or less complete exists in consequence of voluntary, and its sequent, involuntary pollutions, that this state should not be entered upon until the sexual powers are restored. When involuntary pollutions are complicated with enlargement, congestion, or inflammations of the prostate gland, or with gleets, strictures, or affections of the rectum, these must be altogether removed before marriage is advised; and in no case ought it to take place where the testes are soft and wasted, and the spermatic veins varicose, these lesions being often consequent upon, and associated with, the impotency following voluntary or involuntary pollutions.

25. Although LALLEMAND's treatment is very frequently successful, especially in the cases where irritation exists about the mouths of the seminal ducts, and in such as the one now mentioned, when it occurs in the married state, or is caused by venereal excesses, yet several cases have come under my care in which it had failed in the hands of expert surgeons; and the difficult task was imposed of removing, by strictly medical treatment, what surgical means aided by medicine had failed to remove. In most of such obstinate cases, the cure or alleviation of the complaint depends much upon the patient himself; for it is not alone sufficient that he has relinquished the vice in which the evil originated; but it is also requisite that he should so regulate the state of his feelings and passions—so direct his mind, as not to encourage sexual desires, and not to contemplate its disgusting consequences, as either kind of mental rumination will only increase the evil. It will generally be far preferable for the patient to promote his general health and strength by regular living and by regular and sufficient occupation, mental and bodily, avoiding fatigue and *ennui*; to regulate and promote the several digestive and assimilating processes; to increase the tone of the sexual organs by the means suggested above (§§ 19, 20), and to proceed patiently for a time in this course, without injuriously exciting his imagination and desires, and as injuriously directing his attention to the disorder. During a life of celibacy, the discharge may occasionally occur without material injury; and as long as it is not productive of debility, of pains in the back and loins, or weakness of the limbs and joints, or other disorder, and does not recur often—or more frequently than once in ten days or a fortnight, the injury done to the constitution will not be great.

26. It has been supposed by some physicians, that the occasional occurrence of involuntary emissions must necessarily occur to a man who is perfectly continent. This is certainly the case very generally, if the individual have devoted himself to self-pollution in early life, or been married, or been addicted to sexual intercourse, and has afterwards become continent; but a person who has lived chastely during puberty and subsequent manhood, and occupied his mind and body rationally and usefully, without indulging prurient ideas, may pass these, the most likely epochs of life to be subject to this complaint, without experiencing it. The seminal fluid is secreted nevertheless, collects in the seminal vesicles, but, as the susceptibility of these parts and of their associated organs is neither weakened by abuse, nor inordinately increased, nor unnaturally excited so as to produce the venereal orgasm, no anormal discharge of it takes place, although the vesicles continue charged, absorption of the secretion taking place co-ordinately with its elaboration; and thus, instead of proving *excrementitious* and weakening the frame by its absence or loss, it is actually *recrementitious*, and promotes nervous power, the cerebral manifestations, and all the organic and assimilative functions.

27. In young persons, especially those who indulge prurient ideas, or have devoted themselves to weakening self-pollutions or venereal excesses, the constant or frequent desire excites the sexual organs, distends the seminal vesicles, and augments the prostatic secretion, so that the simple contractions of the sphincters after fæcal or urinary evacuations, or the passage of hardened fæces, press out a portion of the contained fluids, which is partly at least seminal, as shown by the presence of spermatozoa, and partly prostatic, mixed with the last drops of urine from the membranous part of the urethra, when passed after micturition. In this class of cases the disorder ceases upon a due regulation of the mind, of the feelings, emotions, &c.; and after the mind and body are duly and healthily employed. For these, especially when no disease of the prostate gland is present and the testes are quite natural, marriage may be safely advised. Although the patient may suppose himself almost impotent owing to the prevalence of the discharge; and may actually be so for a time from his fears, or the impression on his mind that he will be found incapable, yet after marriage his fears subside, his powers return; and no longer is any sexual deficiency or disorder complained of.

28. It is often necessary, both as respects the mind of the patient and as to his scruples respecting marriage in his existing state, that medical treatment should be adopted, and some amendment procured, before this state is entered upon, or even without reference to this state. If the means and regimen above advised (§§ 19. *et seq.*) fail after a due trial, other remedies should be prescribed. The muriated tincture of iron is usually recommended with the tinctura cythe; but they often fail; and in many cases the latter tincture is not appropriate. I have often given the former with the compound tincture of camphor and the infusion or tincture of calumba, and sometimes with decided benefit. When, however, there is pain or heat about the anus, with uneasiness or fulness in the perinæum, or any indication furnished by the excretion of urine or of fæces, of irritation about the seminal ducts or prostate gland, or congestion of the latter, or any affection of the rectum, then local depletions from the perinæum and anus, soothing and gently aperient clysters, and much of the treatment I have advised for inflammation of the PROSTATE GLAND, should be adopted. I some time ago attended a case of successive self-pollution, involuntary seminal discharges and retention of urine,

in which I had the excellent aid of Mr. FERGUSSON. In this case there was superinduced, at an early age, enlargement of the prostate, spasmodic stricture of the urethra, mental weakness, and, as often seen in similar cases, the most cowardly fears of the introduction of a bougie. The nature of the complications, the habits of the patient, and his defective self-control, rendered both medical and surgical treatment only partially successful. In the simpler cases, and where debility and susceptibility of the parts are the chief causes of the complaint, the tonics and stimulants already mentioned, the tincture of iodine in small and very gradually increased doses, the iodide of iron; a cautious trial of powdered nux vomica or its extract or tincture, or of strychnia, or of stramonium; a recourse to blisters over the perinæum or over the sacrum; the application of the emplastrum thuris compositum over the loins; and various other restorative remedies, may be severally advised.

29. If the complaint be associated with ascarides in the rectum, or with hæmorrhoids or other disorders of the rectum, these complications should be removed by the treatment appropriate to them. Pills containing the sulphate of iron, camphor, and assafœtida may be taken, and afterwards oleaginous clysters with salt, camphor, and assafœtida may be occasionally administered for the removal of worms; and associated disease of the *prostate gland* and *hæmorrhoids* should be treated as recommended under these heads.

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POMPHOLYX.—See PEMPHIGUS.

PORRIGO.—See TINEA.

PREGNANCY. — THE PATHOLOGICAL AND THERAPEUTICAL RELATIONS OF. — DISORDERS INCIDENTAL TO PREGNANCY.

CLASSIF. — GENERAL PATHOLOGY. — *Semeiology.* — GENERAL THERAPEUTICS.

1. A change is produced in the uterine organs by impregnation, which affects, sympathetically, the female constitution variously, according to temperament, diathesis, habit of body, predisposition, and age. The more constant and slight changes may be viewed as *physiological*, or as the natural and healthy consequences of the new action imparted to the uterine organs; those which are characterised by more or less derangement of function, may be, with equal justice, considered as *pathological*. But there are other considerations, besides these which relate to the physiological and pathological relations of pregnancy, that will engage the mind of the physician when he is required to treat these disorders, to which pregnancy may predispose, or which it may more directly occasion; and these considerations have strict reference, not only to the treatment required in the particular circumstances of the case, but also to the effects which such treatment may produce upon the state and progress of utero-gestation. Moreover, the pregnant female is not only liable to certain disorders, incident to this state, but also to others, in common with the species — to other maladies which attack all exposed to their causes. Even in the course of several chronic diseases, pregnancy may take place, with or without modification or change of that progress and termination; and thus, the pregnant state is most important in respect of the course, termination and treatment of diseases which occur during its course, as well as of those which had previously existed. The propriety, therefore, of devoting due consideration to the subject cannot be disputed. I have, however, to regret, that my limits admit only of a very succinct account of the several topics which the subject comprises.

2. I. The LOCAL AND SYMPATHETIC CHANGES CONSEQUENT UPON PREGNANCY. — Impregnation induces a remarkable change in the state of the uterine organs. The nerves with which these organs are supplied experience a more continued state of excitement, and probably even an increased development. The blood vessels and lymphatics increase in size, and their actions are augmented; and whilst these organs become, generally, more vascular and more excitable, the uterus itself augments in volume with the progress of the contained embryo. The ganglia and plexuses, supplying the sexual organs are intimately associated, as I have shown in the article SYMPATHY, and in the CROONIAN LECTURES (*published in the Medical Gazette*, vol. xl.) by means of communicating branches of nerves, with the other ganglial and sympathetic nerves, and with the spinal cord and its nerves, both sensory and motory, — with, in fact, the ganglial and the cerebro-spinal nervous systems, from both which these organs derive their energies, and upon, as well as through the media of, these systems, they produce their numerous and varied sympathies. That the uterine nerves, plexuses, and ganglia experience, with the development of the ovum of the uterus and of the uterine vessels, an augmentation of their size, was an opinion entertained by W. HUNTER, and subsequently confirmed by TIEDEMANN and R. LEE. With this remarkable increase of vital action, and of material or structural development of all the constituent tissues of the organ, a more exalted degree of sensibility is imparted, through the media of the organic and cerebro-spinal nervous systems, to the whole

frame, which thus participates, more or less, in the excitement and vital activity of the uterus.

3. When it is considered, that during pregnancy, the uterus, and consequently its constituent tissues, are undergoing a process of development, which Dr. Montgomery has shown to amount, at the full period of utero-gestation, to 519 times its virgin capacity, and to twelve times its solid substance, it cannot be a matter of surprise, that so remarkable a change should be attended by numerous sympathetic phenomena, and that this organ, having become the centre of most important vital actions, should also be the source of various influences and derangements, manifested both by adjoining and by remote parts, during the progress of that change and of the development of the embryo with which it is associated. The remarkable increase of the functions of assimilation, circulation, and nutrition observed to follow the appearance of puberty, is often exceeded during pregnancy; the excitement of the uterine functions, tending even more remarkably, than the first evolution of these functions, to develope all the vital actions and manifestations — to increase the general sensibility and susceptibility, to augment vascular fulness and plethora, and to promote the several secretions and excretions, excepting that excretion furnished by the uterus itself. As consequences of these sympathetic changes, and of various predispositions depending upon temperament, diathesis, habit of body, and previous disorder, numerous ailments arise in the course of pregnancy, as well as others which this state is not concerned in producing.

4. Other disorders also occur in the progress of pregnancy, which depend, more or less, upon the mechanical influence which the increased size of the uterus exercises upon the adjoining viscera, and probably also upon sympathetic excitement, or upon irritation, caused by vascular determination to this organ. As the uterus enlarges, within the pelvis, the rectum, neck of the bladder and urethra experience increased pressure, and some disorder of the functions of excretion is often thereby produced, with pain in the back, and various sympathetic affections of a transient or varying character. As the uterus enlarges further and rises above the brim of the pelvis, the urinary bladder is often pressed upon so as to diminish its capacity, and to occasion frequent calls to pass urine, or even some degree of incontinence of urine. When the womb has nearly, or altogether acquired its utmost size, the mechanical effects produced by it may not be limited to the abdominal viscera, but may extend to the thoracic cavity, occasioning thus disorder of the functions of one, or of several organs. The stomach, duodenum, biliary organs, kidneys and colon, have their functions impeded or disordered; and indigestion, jaundice, constipation, and pains in the back and loins, and changes in the state of the urine are often complained of. The mechanical disturbance extends upwards, the diaphragm being pressed so high as to diminish the thoracic cavities, and to disturb the functions of the lungs and sometimes also of the heart, occasioning dyspnœa, short breathing on slight exertion, and embarrassed circulation through the cavities of the heart. The pressure also upon the veins and absorbents within the pelvis occasions a varicose state of these vessels, œdema, pains of the limbs, numbness, or neuralgic affections. In some cases, especially in females having a small pelvis or abdomen, or who have borne several children, the muscular and integumental parietes become relaxed or pendulous, admitting of mal-positions of the uterus.

5. II. Affections of the Uterine and Genital Organs and of the Mammæ, caused by Pregnancy. — Disorders of related Parts. — i. Œdema of the Labia Vulvæ occurs chiefly in females far advanced in pregnancy, — during the 7th, 8th, and 9th months. It disappears immediately after delivery, and is caused chiefly by the pressure of the gravid uterus, especially when descending into a large pelvis. It is much augmented by a sitting or standing posture, and is characterised by a tense colourless swelling, of equable density, often pitting on pressure, and by absence of throbbing and of increased heat. The œdematous labia may be attacked with erysipelas, shortly before or after delivery, and the utmost danger, or even death may result; or they may be the seat of simple excoriations.

6. *Treatment.* — A mild aperient, repeated occasionally, the recumbent position, and bathing the parts with a suitable lotion, will generally remove the affection. In some instances, diuretics may be necessary: or even puncturing the œdematous parts, so as to allow the discharge of the fluid. If inflammation or erysipelas occur, the treatment should depend upon the peculiar features and circumstances of the case.

7. ii. Pruritus of the Vulvæ.—This is often a very troublesome affection, and frequently connected with a leucorrhœal discharge, or with an aphthous state of the vulva and lower part of the vagina, or with a state resembling an eruption of small papulæ. It is generally referable to the active vascular determination to the sexual organs, consequent upon impregnation.

8. *Treatment.* — Lotions of acetate of lead, or of nitrate of silver have usually been prescribed for this affection. I have generally added a little vinum opii to these. Lotions, consisting only of tar-water will generally prove efficacious. In the summer of 1826 I was consulted by a surgeon in an obstinate case, for which the usual means had been employed. I advised a saturated solution of borax in rose-water; and this proved successful. Since that time I have generally prescribed this substance for similar cases. Dr. Churchill states, that a decidedly antiphlogistic treatment may sometimes be required — as venesection, leeches applied to the vulva, and one or two smart purgatives.

9. iii. Leucorrhœa is generally caused by the increased determination of blood to the uterine organs during pregnancy, and probably, also, in part, by the pressure of the gravid uterus. It sometimes occasions great debility, and increases the aching of the back often complained of during pregnancy. It may, when excessive in the early months, cause abortion; but, at an advanced period, it is not very injurious, otherwise than by producing or increasing debility.

10. *Treatment.* — The propriety of removing or suppressing this discharge ought to be considered before any treatment is ordered for it. In many cases, the inconvenience is not so great as to require treatment. But, in some instances, the discharge is so exhausting as to require to be

moderated, if not altogether arrested. To strong, plethoric females, and where the disorder proceeds from active determination of blood to the uterine organs, a moderate venesection and cooling aperients will prove beneficial. In weak or delicate females, and when the digestive organs are disordered, the bitter infusions, as those of cheyreita or of calumba, with small doses of the muriated tincture of iron, or with a mineral acid, will be of service. If the discharge occur in connection with any pulmonary affection, it may be moderated by internal remedies; but it should not be arrested by powerful astringents. (See art. Leucorrhœa.)

11. iv. Menstruation during Pregnancy, or rather a periodical discharge of a sanguineous fluid from the vagina, have been occasionally observed. This discharge may occur once or oftener during utero-gestation, and after irregular intervals, but it most frequently takes place at the menstrual periods, and, in some instances, it returns for three, four, five, or six months, or even for the whole period of pregnancy. Drs. Denman and Hamilton have doubted the occurrence of these discharges, a scepticism the more remarkable considering the great experience of these physicians, and the frequency of the phenomenon according to the observation of very eminent practitioners. Although I have never been engaged in the practice of midwifery, yet I have been consulted in two cases, in which this discharge was stated to have occurred regularly during four or five successive menstrual periods; and not in one pregnancy only, but in each of several occasions of utero-gestation. Neither of these patients had ever had an abortion. The discharge was represented to have continued from three to four days, to have become paler than usual after the second day, and to have passed into a moderate leucorrhœa. It does not appear to be attended with any inconvenience to the patient, beyond increased aching of the back and loins. The growth of the child is not affected by it; although, judging from the instances which I have seen, the constitution is rendered more delicate; so that the aphorism of Hippocrates, "that the children of women who menstruate during pregnancy cannot be healthy," appears partly true. The discharge probably proceeds from the vessels of the cervix uteri and vagina, in consequence of the more than usual vascular determination to the uterine organs during pregnancy, the periodic recurrence being the consequence either of ovarian excitement and influence, or of habit.

12. *Treatment*, in most instances, is unnecessary, or nearly so. In one of the two cases which I have alluded to, the lady who was its subject had four children, and this discharge occurred during each pregnancy. Nothing beyond the recumbent posture, and quietude as long as the discharge continued, was prescribed. Three of the four children are living and well, but are of delicate constitutions. Hippocrates advises cupping over the mammæ, and Mauriceau bleeding from the arm. Neither of the cases which I saw required any depletion.

13. v. Watery Discharges from the Vagina have caused some discussion as to their source or sources. The fluid has been referred to the glands of the cervix uteri, but they cannot be supposed capable of furnishing so abundant and so clear a fluid; although these glands and those of the vagina often furnish a copious mucous secretion. The fluid is more probably collected between the amnion and chorion, or between the chorion and decidua, and evacuated during the advanced stage of pregnancy, or some time before the commencement of labour. In rare instances, the fluid may be actually the liquor amnii. Dr. Burns remarks, that he has known cases where a considerable discharge of water has taken place after fright or exertion, with subsidence of the abdominal tumour, a feeling of slackness, and irregular pains, and yet the woman has gone to the full time. Other writers have made the same observation. Dr. Davis mentions these discharges, especially when they occur "in dribbling quantities weeks or months before labour," as indicative of great consequent danger. But in this, other authors do not quite agree with him. The source of the fluid can be inferred only from the quantity and the recurrence of the discharge, and the effect produced upon the abdominal tumour. If the discharge be great, sudden, and affecting the tumour, it may be referred to the escape of the liquor amnii. If it be gradual, small in quantity, and does not affect the abdominal tumour, it may proceed from the other sources pointed out.

14. The *treatment* consists in keeping the patient dry, clean, and perfectly quiet. An anodyne may be given as circumstances may suggest a recourse to it; and the bowels kept gently open by cooling aperients. Injections *per vaginam*, similar to those advised for *leucorrhœa*, have been recommended, but they are of doubtful efficacy; all perturbations, whether mental, physical, or medical, being much more injurious than beneficial.

15. vi. Dropsy of the Amnion.—See art. Dropsy, § 113. *et seq.*

16. vii. Rheumatism and Spasm of the Uterus have been described chiefly by German and French pathologists. Rheumatism may attack the uterus, as well as other fibrous structures, although much less frequently than those of more superficial or external parts.—It is *characterised* by severe pain, increased on motion and the contraction of the abdominal muscles; by augmented sensibility and tenderness; and by symptomatic fever and restlessness.—*a.* It is *caused* by cold, currents of cold air, and the usual causes of rheumatism acting upon a rheumatic diathesis. Velten states that it was observed during an epidemic of rheumatism; and Wigand, Joerg, and others, that it was caused by the projection of the clothes, during advanced pregnancy, by the enlarged abdomen, producing exposure of the lower part of the body. It may occur at any period of gestation, but is much more frequent in the latter months. The slighter states of it are very probably, as Dr. Churchill suggests, what have commonly been called "false pains."

17. *b. Symptoms.*—The milder attacks consist chiefly of shooting pains in the region of the uterus, occurring at intervals, and either limited to a small space, or affecting the organ more generally. The severer attacks occur often suddenly, and without any apparent cause; are attended by violent pain in the region of the uterus, the duration and the character of the suffering distinguishing them from the commencement of labour, even although there may be distinct con-

tractions of the uterus, and slight dilatation of the os uteri. In the milder forms there is little or no constitutional disturbance; but the more severe are attended by quickened pulse, hot skin, sleeplessness, and restlessness. Rheumatism of the uterus is generally accompanied with spasm, or irregular contraction of the organ, which is sometimes extended to the lower limbs. The irritation is occasionally also propagated to the bladder, causing frequent and painful micturition, and to the bowels, occasioning colic, tenesmus, or diarrhœa. "The motions of the child are a source of great torment, owing to the increased sensibility of the womb; and from some sympathy with the mother, it not infrequently happens that these motions are peculiarly lively."

18. When the affection occurs during parturition, Wigand, Dezeimeris, and Churchill state that the natural pains are arrested, or become tedious, ineffective, sudden or interrupted, and more distressing than usual. The patient is hot, thirsty, and irritable, or restless; the pulse being quick, and either full, soft, and undulating, or small and hard. The uterus is very tender, the weight of the bed-clothes occasioning much pain; and the cervix and os uteri are often tender and painful on examination. If the case be left to itself, the pains become weaker, or suspended for hours. If the patient falls into perspiration and sleep, the natural pains recur, and delivery is favourably terminated.—(Churchill.)

19. *c.* The *diagnosis* between rheumatism and inflammation of the uterus consists in the more limited and continued pain of inflammation, and in the more sudden, spasmodic, and paroxysmal character of the pain of rheumatism. It is not improbable that some cases, occurring in the eighth or ninth months of pregnancy, are merely spasmodic paroxysms, or irregular contractions of the body of the organ, and not truly rheumatism affecting its structure.

20. *d.* The *prognosis* is generally favourable, when the patient comes early under treatment; but if she be neglected, abortion or premature labour may follow the continuance of the attack, and the repeated contractions of the uterus and spasm attending the complaint. Slight dilatation of the os uteri usually attends the period of severe suffering; but this part regains its natural state upon the subsidence of the attack. Joerg states, that the child is less frequently injured by rheumatism than by inflammation of the uterus.

21. *e.* The *treatment* consists of venesection varying in amount from six to twelve or sixteen ounces, when the patient is young, strong or plethoric, and when there is fever with a hard or full pulse; of sedatives and diaphoretics; and of anodyne enemata. Opium with ipecacuanha may be given at bed-time, or Dover's powder; and after opening the bowels by a suitable aperient an emollient and anodyne clyster should be administered. An opium or belladonna plaster may be applied over the abdomen or loins; and diaphoretics should be administered at intervals conjoined with an opiate or some other narcotic. The warm embrocation containing spirits of turpentine, with a considerable proportion of the wine or tincture of opium, may be applied over the abdomen. If the attack occur at the commencement of parturition, this embrocation, without the opium, will generally prove efficacious. The bowels ought to be kept quietly open so as to prevent fæcal accumulations; and the diet duly regulated.

22. viii. Inflammation of the pregnant Uterus.—Inflammations of the womb in the unimpregnated state, and after delivery, are described in the articles Uterus and Puerperal Diseases. I have merely to notice such peculiarities as hysteritis presents during gestation. As may be anticipated from the physiological conditions of the uterus, inflammation attacks the impregnated organ more frequently than the unimpregnated, although less so than after delivery. —*a.* It is *caused* by exposures to cold, by injury, by concussions of the trunk, by the abuse of spirituous liquors, and by the extension of inflammation from adjoining parts. Hysteritis during pregnancy and after delivery, as observed in the metropolis, is chiefly caused by the abuse of spirituous liquors, more especially of gin. It is said to be most frequently observed in the sanguine and irritable temperaments, and scrofulous diathesis, and seldom to occupy the entire uterus unless in the very early months. In the latter months of pregnancy, it is more limited, affecting chiefly the lower portions or cervix. At earlier periods it is commonly seated in that part to which the placenta is attached. The inflammation is seated in the muscular structure, but the peritoneal coat may also be implicated; in which case partial or limited adhesions may form between the fundus or body of the uterus and adjoining parts, as I have observed in several instances.

23. *b. The symptoms* are a severe, constant or aching pain in some part of the abdominal tumor, increased upon pressure, upon sudden motion, walking or descending stairs quickly, and by the movements of the child. It often extends to the back and groins. Sometimes dysuria, or a frequent desire to pass urine, or tenesmus, or pain on going to stool, is complained of. More or less sympathetic disturbance is produced, especially heat of skin, quickened pulse, thirst, nausea or vomiting. "If the disease be very limited, the child may escape injury, and gestation be completed; but, if more extended, the fœtus will probably perish in utero, or be prematurely expelled." Unless the disease be completely removed, and the womb restored to a healthy condition, the consequences during parturition may be very serious. Dr. Gason informed Dr. Churchill that, in three cases of inflammation of the womb during pregnancy, rupture took place during labour in the exact spot previously diseased. Dr. E. Murphy states that most instances of rupture of the uterus may be traced to lesions either previously existing or produced by inflammation. The wife of a respectable tradesman, for whose family I was often consulted, complained of hysteritis at an advanced period of pregnancy. She had had several children, and her constitution was much injured by gin-drinking. She sunk almost instantly upon delivery from sudden and profuse flooding. Inspection of the body was not allowed.

24. *c.* Hysteritis during pregnancy may *terminate*—1st. In resolution, the patient going her full time and being safely delivered:—2d. In effusion of lymph and the firm adhesion of the placenta to the uterus:—3d. In softening of the structure of the organ, favouring rupture or

dangerous or fatal hæmorrhage: — 4th. In the production of an abscess or small abscesses in the inflamed portion of the uterine parietes: — and, 5th. Even in gangrene, as described chiefly by the German writers on diseases of the uterus.

25. *d.* The *prognosis*, as shown by these terminations ought to be guarded, especially when the disease occurs in females addicted to the use of spirits, to whom it is frequently fatal in one of the ways now indicated.

26. *e.* The *treatment* should depend upon the habit of body, strength, and habits of the patient, and upon the extent and severity of the local symptoms and of the constitutional affection. Although the local suffering is generally less severe than in rheumatism of the womb, the constitutional disturbance is greater, and a more decided and prompt treatment is often required. In other respects the treatment is much the same as recommended for rheumatism of the organ. Local vascular depletions are generally beneficial; and calomel, camphor and opium are also of service. In other respects the treatment should be the same as advised for inflammation of the womb, in the other articles comprising it. "(See Uterus and Puerperal Fevers.)

27. III. Affections occurring sympathetically during Pregnancy.—The general systems and the more remote organs may experience more or less disorder in the course of pregnancy, arising either directly from the altered state of the uterus; or indirectly, as from fæcal accumulations in the large bowels, that are apt to form during the earlier periods of gestation.—*i.* The digestive organs often experience more or less disorder. The slighter or less important of them may be only mentioned.—*A.* Tooth-ache is frequently complained of; but is owing to the common causes of the affection; for it is not usually felt when these causes have not existed before conception; pregnancy either directly or indirectly aggravating merely a pre-existing evil. The bowels generally require moderate but repeated doses of stomachic aperients, and afterwards anodynes, locally and internally, preparations of iron, narcotics and antispasmodics, &c. The question as to the propriety of extraction or of other painful operations for this complaint during pregnancy may be considered as set at rest by having recourse to æther or chloroform inhalation.

28. *B.* Salivation is sometimes troublesome; but it is rarely of great importance. It will generally be moderated or removed by a judicious use of stomachic or cooling aperients; by cooling and astringent gargles, and attention to the states of the gums and teeth. Rinsing the mouth often with tar-water, or with mucilaginous fluids containing creasote or spirits of turpentine, will generally be useful, and also benefit the teeth and gums. *Capricious or morbid appetite* is not infrequent during pregnancy; but this topic suggests nothing of any importance in addition to what I have stated in the article Appetite. If, however, carried to an extreme, it may, as well as frights and violent mental perturbations, affect the development of the fœtus.

29. *C.* Nausea and Vomiting generally occur at some period of gestation,—most frequently from the third to the sixth week after conception, although occasionally only a few days after this act; and sometimes not until the seventh or eighth months of gestation. At the earlier periods these symptoms are merely sympathetic. In the latter months they may in some measure be caused by the pressure of the uterus.—*a.* The patient usually finds her stomach uncomfortable on rising in the morning, and the discomfort soon amounts to nausea or vomiting. Whether the stomach be evacuated or not, the nausea ceases after a few minutes or within an hour; and, after some delay, breakfast is taken with the usual or good appetite, and without subsequent inconvenience. These attacks are renewed every morning for six weeks or two months, when they gradually subside. In some cases, vomiting does occur until a full meal is taken. It may also take place at any time of the day, or in the evening. Instead of gradually ceasing about the third or fourth month or after quickening, it occasionally continues during pregnancy, causing great distress and some risk. If carried beyond certain limits, it may occasion miscarriage. When vomiting follows a meal the constitution of the patient languishes from a want of due nourishment as well as from the continued irritation, the patient even sinking from inanition or exhaustion. Several instances of this issue are recorded in the works referred to in the *bibliography*. When the progress of pregnancy is arrested by the death of the fœtus, then the vomiting ceases spontaneously. Instances have occurred of an internal organ, the uterus, stomach, &c. having been ruptured by the violence of the vomiting. The matters thrown off the stomach may be thin, watery, glairy, colourless; or consist partly of bile, or of blood. In severe cases they are greenish or blackish, owing to an admixture of bile or an exudation of blood. The vomiting is generally attended by tenderness at the epigastrium, prostration of strength, a weak, small, quick pulse, constipated bowels, and sometimes a loaded tongue.

30. *b.* *The causes* of the serious cases of vomiting during pregnancy have not been duly investigated even by those physicians who believe themselves the sole depositories of the knowledge of female maladies. Writers on these maladies have not even shown whether or not this vomiting may not result from disease of the uterus or of the ovum; and they have not always attended to the existence of disease of the liver and biliary apparatus, or of the duodenum and pancreas, or of the stomach itself; or to the presence of scybala, or of irritating substances locked up in the cells of the colon. They even furnish no information as to the states of the kidneys or of the ovaria,—so little has a division of labour hitherto tended to advance this department of medical science. Cases, however, have occurred when dangerous or fatal vomiting has been caused chiefly by lesions seated as just stated, or by retained irritating matters, pregnancy merely developing and perpetuating a sympathetic disease, which in most of its morbid relations had previously existed, but had been latent, until it became aggravated or excited by the change in the uterine organs.

31. *c.* The *diagnosis* of vomiting should not be overlooked, with reference to its dependence or non-dependence on pregnancy. The chief circumstances indicative of its dependence on this cause, are its occurrence and daily recurrence in connection with the disappearance of the catamenia, the speedy return of appetite and of the

appearance of good health in the intervals, the changes apparent in the nipple, areolæ and in the mammæ, and the absence of any sign of disease of the stomach itself, or of any other organ.

32. *d. Treatment.*—In slight cases, and especially during the early months, little or no treatment is necessary; time will remove the disorder. But the bowels should always be kept gently open, as any accumulation in the large bowels aggravate the complaint. If nausea be distressing and unaccompanied with vomiting, an ipecacuanha emetic will often be of use, at an early period of gestation; and, after having evacuated the bowels, the infusion of calumba, or of cheyreita may be given. If the patient be very robust or plethoric, a moderate bleeding will be serviceable at the commencement; but at a later period, or when she is reduced by the duration of the disorder, it is inappropriate. Gentle, stomachic or cooling aperients, suited to the circumstances of the case, are generally beneficial. The most useful are, the confection of senna with magnesia; the infusions of calumba and of senna with tartrate of potash, with an aromatic spirit; the compound infusion of roses with sulphate of magnesia, a little dilute sulphuric acid, and tincture of orange peel; and, if the bowels are not much confined and the sickness more urgent, from a scruple to half a drachm of sulphate of magnesia with fifteen grains or a scruple of magnesia, and four or five drops of tincture of opium, in spear-mint water, taken once, twice, or thrice daily. In several cases, the nausea or the vomiting is aggravated or perpetuated by acidity, especially if flatulency is complained of. The infusion of calumba, with magnesia and ammonia, is then very beneficial. Small morsels of ice are sometimes of use.

33. In more severe cases, the application of embrocations over the stomach, or mustard poultices, or terebinthinate epithems, or blisters, may be resorted to. When the matters thrown off are acid, acrid, or attended by flatulent eructations, powdered charcoal, magnesia, ammonia, or other alkalies, are severally of use. The hydrocyanic acid may also be given; or creasote, either in pills or in mucilaginous mixtures. The several preparations of opium, or of morphia, conjoined with other medicines—either those already enumerated, or warm aromatics and spices, as capsicum, aromatic confection, &c.—are sometimes of service, and embrocations or epithems with laudanum over the stomach afford relief in the more urgent circumstances of the case. During the use of these means, the bowels ought to be preserved in an open state, either by such aperients as are most likely to be retained on the stomach, or by laxative and anodyne clysters. When the bowels are sufficiently evacuated, starch enemata, containing syrup of poppies, or the compound tincture of camphor, will then be of service. In all circumstances the horizontal posture ought to be adopted, and strict attention paid to diet, the patient's desire for articles of food being indulged, if there be no reason to the contrary. When all other means fail, and the case admits of the measure, the induction of premature labour may be contemplated, or even attempted.

34. *D.* Heartburn, Pyrosis, spasmodic and colicky pains, are often complained of during pregnancy, and are severally relieved by antacids, conjoined with tonics, antispasmodics, and anodynes, and by a due promotion of the intestinal secretions and excretions, as just advised for *nausea* or *vomiting*, or as they are more fully directed in the articles Indigestion, Colic, Pyrosis, and Stomach.

35. *E.* Constipation of the bowels is very common during pregnancy, and always aggravates the disorders of the stomach, which have been noticed above.—*a.* It is *caused*, in some instances, by the pressure of the gravid uterus on the rectum and sigmoid flexure of the colon; by impaired action of the bowels, in others, owing to vital and vascular determination to the uterus; and not infrequently it is increased by the impaction of hardened fæces in the cells of the colon. Fæcal accumulations in the cells may exist, and may even endure for weeks or months without the constipation being remarkable; and in this way many of the disorders of pregnancy may be produced or aggravated; not merely those already mentioned, but also headaches, restlessness, watchfulness, colicky pains in the abdomen; weight, flatulence, and distension in this cavity; hæmorrhoids, and sometimes diarrhœa or tenesmus. If these ailments continue or increase, owing to the retention of fæcal collections, inflammation of the bowels or dysentery, or abortion may supervene. If constipation, and the collections of fæcal matters in the bowels consequent upon it, take place during the latter months of gestation, or be retained until the period of delivery, the diseases incidental to that period are very readily produced.

36. *b.* The *treatment* consists of the occasional recourse to the aperients already mentioned; to rhubarb and magnesia; to the infusions of gentian and senna, with such adjuncts as may suggest themselves; to confection of senna with sulphur and magnesia; to castor oil, or olive oil taken in small and frequent doses; to the compound rhubarb pill with extract of henbane and Castile soap, and sometimes also a little ipecacuanha; to emollient and laxative enemata; or to soap or oleaginous clysters. In obstinate cases, more active means may be employed, with due reference to the situation of the patient; and for these I must refer the reader to the Article Constipation and Costiveness.

37. *F.* Diarrhœa is often met with during pregnancy as a consequence of improper food, &c., and of neglect of the bowels, or of constipation. It may be kept up by the presence of hardened fæces in the cells of the colon.—*a.* It may occur at any period of pregnancy, and may arise from cold, from mental perturbation, from the state of the secretions and excretions, and without any assignable cause. The acidity consequent upon imperfect digestion often occasion it. Very recently I was consulted respecting a case which resisted absorbents, astringents, tonics, opiates, &c. The patient accidentally mentioned her addiction to the use of immoderate quantities of sugar. This substance was interdicted, unless in small quantity; and within three or four days afterwards, the same medicines as were previously taken without benefit removed the complaint.

38. *b.* The *Treatment* consists of small doses of hydrarg. cum creta with Dover's powder; or of small quantities of rhubarb with ipecacuanha and dried sub-carbonate of soda; of ipecacuanha with

the extract of hop, or with the compound soap pill; of cretaceous mixture with compound tincture of camphor, or tincture of hop; and of flannel clothing worn next the skin, and suitable diet. (See also Art. Diarrhœa.)

39. *G.* Jaundice is not of frequent occurrence during pregnancy. It may appear at any period of gestation, but more frequently during the later months, and in females who have had several children, or are advancing in life. It generally continues until after delivery. It may be *caused* by the pressure of the gravid uterus, but more frequently by some one of the several pathological conditions assigned in the Article Jaundice. The symptoms vary with these conditions; and the *Treatment* should have strict reference to them, as well as to the stage of pregnancy and other peculiarities of the case. Although laxatives, or even cholagogue purgatives, may be cautiously employed and repeated more or less frequently; yet active cathartic, or other heroic measures, should not be prescribed. If nausea or vomiting occur, or diarrhœa, the remedies advised above for these may be employed; and the more urgent symptoms, as pain and spasm, should be palliated by means of narcotics, &c. If the symptoms indicate active congestion or inflammation of the liver, bleeding and other antiphlogistic means must be adopted.

40. ii. Various Disorders of the Heart and Respiratory Organs sometimes occur during pregnancy. These are apt to appear in hysterical or nervous females, and during a first pregnancy. — *A.* Faintness, fainting, or full syncope, is most apt to occur at the period of quickening, but it may take place at any period, or may recur occasionally or frequently. Delicate and weak females are most liable to it. "Towards the end of pregnancy, fainting is regarded with much suspicion, not so much for the immediate consequences as for its effect upon convalescence after parturition." (Churchill.) It may prove a serious affection if it depend upon passive dilatation of any of the cavities or orifices, or other organic disease of the heart — lesions which consultation will detect.

41. *B.* Palpitations of the Heart are often connected with faintness or syncope, either of these preceding or following the other; and both affections often depending upon the pressure of the gravid uterus upon the digestive organs, and of these latter upon the diaphragm. The embarrassment thus occasioned to the circulation through the heart is often increased by collections of flatus in the stomach, and even in the œsophagus, as well as in other parts of the digestive canal, these collections being often retained by spasm of adjoining parts of the canal. These symptomatic affections are usually *caused*, developed, or aggravated, by mental emotions and perturbations, by errors in diet, by startling noises or occurrences, by disordered states of the stomach and bowels, and by a susceptible and hysterical diathesis. The *Treatment* is nearly the same for both affections. During the paroxysm of faintness the patient should assume the horizontal position; during that of palpitation, the sitting. Antispasmodics and stimulants are beneficial for both, — especially those which are prescribed for hysteria. Between the attacks, tonics, restoratives, quinine or cinchona, the bitter infusions or decoctions, stomachic aperients, with due attention to diet and regimen, will generally prevent a return of disorder.

42. *C.* Cough and Dyspnœa may occur in the early months from sympathy. Either of these may then assume an hysterical character; the cough depending chiefly on sympathetic irritation of the larynx or trachea, and dyspnœa arising either from the same cause or from affection of the bronchi or respiratory nerves. In these circumstances, both cough and dyspnœa are nervous, spasmodic, or hysterical. But in the advanced stage of gestation, both affections may be caused and continued by the pressure of the gravid uterus, and aggravated by flatulence, indigestion, and costiveness. The *diagnosis* should, however, be established by means of the stethoscope and percussion, and by an attentive consideration of the several rational symptoms, lest these symptoms proceed from pneumonia, bronchitis, tubercular disease, or some other malady that has supervened, or been developed, in the course of pregnancy. When these affections are merely nervous and sympathetic, the *treatment* should be antispasmodic and anodyne. The bowels ought to be freely evacuated, and kept duly open; and acidity of stomach and flatulence prevented by means of tonics, antacids, and carminatives, as already advised, the diet and regimen being duly regulated. If these affections occur in full and robust females, they may be connected with pulmonary congestion, and then blood-letting is requisite. When the cough is severe, the use of narcotics and anodynes is of service, in order to moderate it and to diminish the risk to the fœtus. If it be attended by dyspnœa, pain, or fever, or by adhesive or glairy expectoration, blood-letting is also proper, with antimonial and other diaphoretics.

43. *D.* Hæmoptysis may occur with or without either or both of the affections just noticed. It is not often observed; for pregnancy more frequently removes than induces this complaint. When, therefore, it is met with during pregnancy, it should be viewed as a most serious evil, and the means advised for hæmorrhages promptly employed, according to the state of the case, especially blood-letting, cupping over the back or thorax, acetate of lead with opium, digitalis, acids, antimonial diaphoretics, turpentine epithems applied over the chest, &c.

44. iii. Disorders of the Nervous System during Pregnancy. — *A.* Headaches are frequently experienced during utero-gestation, and chiefly by two classes of constitution: — 1st, by the delicate, nervous, hysterical, and those deficient in blood; 2nd, by the plethoric and robust. In the earlier months, the nervous character of headach is most pronounced, in the later months the congestive or plethoric. This latter form is often connected with impeded circulation through the heart and lungs, in consequence of the pressure of the gravid uterus, and in this case more particularly it is aggravated by indigestion, flatulency, and costiveness. The *nervous* form of headach is often limited, as to the vertex — the *clavus hystericus*, — or to one side — *hemicrania*. It is oftener felt in paroxysms, than without intermissions; and it is unattended by flushings of the face, heat of scalp, or injection of the conjunctivæ. *Congestive* or *plethoric* headach is attended by flushing, increased heat of scalp, in-

jected eyes, a sense of throbbing, distension or fulness, by intolerance of light and sound, and it usually commences in the forehead, and extends equally to both sides; it is also continued and sometimes increased by a meal; whilst the nervous variety is relieved by a meal and by stimuli.

45. The *Treatment* is different in either case. The *nervous form* requires stimulants, antispasmodics, and tonics, as ammonia, camphor, valerian, cascarilla, &c.; the *congestive*, moderate blood-letting, general, or local, according to circumstances, purgatives, diaphoretics, &c. In all cases, the diet and regimen ought to be suited to the form of headach which is complained of; and the uses of all stimulating or restorative beverages either allowed or disallowed accordingly.

46. *B.* SLEEPLESSNESS is sometimes a distressing complaint of nervous, hysterical, and delicate females, especially as pregnancy advances. It is most liable to affect those who shut themselves in-doors, and deprive themselves of exercise in the open air, and who sleep in too warm and ill-ventilated chambers, or with too much bed-clothes. It is often attended by restlessness, by anxiety respecting trifling matters, and ultimately by despondency, and even by hypochondriasis. It is also intimately allied, and often associated with, *nervous headaches*. It is much more rarely associated with plethoric headach.

47. *Treatment.*—Besides the means already advised for *nervous* and hysterical headaches (§ 45.), I have seen decided benefit result from a draught at bed-time, containing a drachm of the tincture of hop, with five or six of the carbonate of ammonia, or from twelve to twenty grains of the carbonate of potash, or soda, or magnesia. When the sleeplessness is attended by indications of *plethora* and active determination of blood to the head, and with the usual indications of *congestive* headach (§ 44.), then vascular depletions, purgatives, and other antiphlogistic means, and low diet, are required.

48. *C.* DESPONDENCY AND HYPOCHONDRIASIS are not infrequent in hysterical females, especially during a first pregnancy, and more especially in unmarried females. In married females, these moral affections are most commonly seen in the delicate constitution and hysterical diathesis, and are often attributable to no other exciting cause than the contemplation of the future pains and contingencies of child birth, or the private contrarieties and anxieties of married life. In the unmarried, numerous and painful reflections serve to develope these mental conditions, and even to carry them on to a state verging on insanity, and subversive of due control. In many such cases, the sentiments and emotions excite the cerebral circulation, and this in its turn augments the despondency, or carries it beyond the limits of sane judgment and conduct.

49. The *Treatment* depends upon the peculiar circumstances, moral and physical, of each case. If the despondency proceed from fears of the dangers of child-birth—a cause which seldom exists alone—a true statement of the small amount of that risk will generally allay such fears, for there are very few females, however inexperienced, who indulge such fears after knowing the truth, especially when their hopes are excited and promoted by affection. If the disorder of the mind is truly nervous or hysterical, agreeable society, change of scene and of air, gentle exercise, mental occupation of a pleasant kind, healthy air, and restorative treatment will generally remove it. If the temperature of the scalp, the appearance of the eyes and countenance, and the action of the carotids, indicate increased determination of blood to the head, then moderate bleeding, especially if the patient be strong or plethoric, cold sponging the head frequently, mild purgatives, derivatives, warm clothing on the lower parts of the body, and light digestible food will be requisite, with such other means as the peculiarities of the case may suggest.

50. *D.* CONVULSIONS during pregnancy assume one or other of these forms—the *hysterical*, the *epileptic*, or the *apoplectic*. The *first* of these is confined to utero-gestation, and is much more frequent during the early months than at an advanced stage. It is chiefly dependent upon the vital excitement and vascular determination to the sexual organs, and affects chiefly the weak, delicate, and hysterical constitution. The character and treatment are in all respects the same as described in the article HYSTERIA. *Epileptic convulsions* are the most frequent forms of convulsions at an advanced period of pregnancy; and the *apoplectic* during or after parturition. They are fully discussed in the articles CONVULSION (§§ 27—88.) and EPILEPSY.

51. *E.* PAINFUL AFFECTIONS OF THE MAMMÆ—*Mastodynia*—often commence during pregnancy with pricking or tingling sensations in them, followed by shooting pains, with slight soreness of the nipples, and increased size of the mammæ themselves and especially of the glandular structure. The pains may be either of a neuralgic character, and owing to sympathy with the increased excitement of the uterus, or altogether consequent upon the stretching of the fibrous envelope by increased development of the glandular structure. In the latter months the pain is often dependent upon active vascular determination, which may go on to inflammation and abscess.

52. The *Treatment* consists of fomentations, or frictions with oleaginous and anodyne liniments, or emollient poultices. In many cases no treatment is necessary. In the severer attacks, if these means fail, anodynes, cooling aperients, and antimonial diaphoretics may be prescribed: blood-letting, general or local, is seldom required, unless great tension, enlargement or increased heat exist, and then the application of a number of leeches, or even venesection, should not be delayed, especially in plethoric females, lest active determination and congestion should go on to inflammation and its usual consequence, abscess. (See Art. MAMMÆ.)

53. *F.* VARIOUS OTHER SYMPTOMATIC DISORDERS, AND EVEN STRUCTURAL DISEASES, occasionally supervene in the course of pregnancy, owing either to the sympathy existing between the parts affected, or to the pressure of the gravid uterus. To the former of these states anomalous affections of the organs of sense, especially of sight and hearing, altered sensibility of various parts, occasional spasms, slight attacks of singultus, eccentricities of conduct or of sentiment, &c. are chiefly owing. To the latter cause, hæmorrhoids, incontinence, or retention of urine, varicose veins, cramps or

spasms of the lower limbs, œdema, anasarca, ascites, &c. are chiefly to be referred, and are noticed in their relations to the pregnant state in the articles in which these several maladies are described.

54. III. Influence of Pregnancy upon the Course, Termination, and Treatment of Chronic or Pre-existent Diseases.—*A.* Various pre-existent maladies have no influence in preventing conception; a very few have even the effect of favouring the act, especially tubercular and scrofulous diseases when not very far advanced; glandular enlargements, slight hæmorrhages, hysteria, &c. Several of these maladies, indeed most of them, and especially those now named, are either altogether arrested in their progress, or impeded or rendered latent, owing to the vital determination to, and increased vascular action developed in, the sexual organs, and to the salutary influence exerted thereby, throughout the œconomy. Pulmonary affections, especially tubercles in the lungs and hæmoptysis are generally arrested, if not too far advanced; the pulmonary symptoms often almost disappearing during the continuance of pregnancy; but, soon after parturition, they often re-appear with much greater severity, and sometimes with various associations. When pregnancy occurs at an advanced stage of phthisis, the disease is only partially abated, or rendered somewhat more latent; and, in this case, not only is the child born with tubercles already formed, as I have ascertained by inspection in three instances, but the mother sinks in a short time after delivery with remarkable increase of the pulmonary symptoms, either granular degeneration of the kidneys with anasarca, ascites, &c., or delirium, or some other complication, besides the more common one of colliquative diarrhœa, rapidly appearing, and accelerating a fatal issue. When the pulmonary symptoms are only slight, the tubercles not having gone on to softening, then not only may pregnancy arrest the further progress of the malady, but also may subsequent lactation, if duly managed so as not to impair the strength, exert a similar preservative influence, until pregnancy again recurs; and thus the disease, which had appeared before marriage, and had even been attended by hæmoptysis, be kept at bay for several pregnancies, or until the cessation of child-bearing, when it generally reappears and runs its usual course. I have seen a lady who had experienced an attack of hæmoptysis before marriage, have nine children, and enjoyed tolerably good health, and, having ceased to become pregnant, die of consumption two or three years after the birth of her last child.

55. Although pregnancy thus arrests the progress of chronic maladies in most instances, yet, if these maladies are of so severe a character as not to be removed altogether, as some of them are, by this state, and by the changes induced by it in the frame, they may be very remarkably aggravated after parturition, or during the last stage of gestation. Epileptic seizures may be rendered fewer or slighter during pregnancy, especially in the earlier periods; but they may be more severe at an advanced period, or even fatal during parturition. Paralytic affections, even hemiplegia, or paraplegia may be complete, and yet the patient become pregnant, bear a child at the usual period, and even become pregnant several times; but there is an increased risk of apoplectic seizures, or convulsions, during advanced pregnancy, and during parturition. Pregnancy has generally a beneficial effect upon hysteria, leucorrhœa, and dysmenorrhœa, but there are not infrequent exceptions; and, in several other diseases, so many circumstances tend to vary the results, provided pregnancy actually occur in their course, that nothing precise can be advanced respecting them. During chlorosis and anæmia, particularly the former, pregnancy may not take place; but if it occur in either, a very beneficial change generally results.

56. *B. As to the management or treatment of pregnancy thus occurring during chronic maladies*, but little can be said. The suggestions of good sense, guided by pathological knowledge, will point out what ought to be done and what avoided, in the different and ever varying circumstances in which medical advice will be required. In most instances, officious interference will be more prejudicial than beneficial; and the operations of nature, aided by suitable diet, pure, temperate, and dry air, and a gentle promotion of the several vital and excreting functions, will do more than any plan that can be laid down. Heroic or even active remedies should be avoided. They are out of place in these cases, and are only employed by charlatans and pretenders in and out of the pale of the profession. In these, as well as in other circumstances, it is not only the probable good which may be done, but the possible evil also which may follow, that should engage our minds and guide our determinations as to the use of any remedy and the adoption of a particular plan of cure.

57. IV. Influence exerted by Pregnancy on the Production, Course, and Treatment of Acute Maladies.—*A.* During pregnancy, the increased manifestations of vital action throughout the frame tend to ward off many of the slighter causes of disease; and even others of a more energetic kind which would have, in other circumstances, been productive of disease, fail of causing it, or cause it in a less degree, during this state. Various epidemics have been observed to affect a smaller proportion of pregnant women than of others, and even endemic diseases have been less frequent among them. Epidemic diseases of a malignant character, or those which often assume a malignant form, as smallpox, scarlet fever, measles, erysipelas, typhous and adynamic fevers are liable to become not only malignant but rapidly fatal when they attack pregnant females, although this class of females are less predisposed to them than others. If these maladies appear at an early stage of gestation, abortion is likely to occur, and the danger is thereby increased; if they appear at an advanced period, or shortly before parturition, premature labour often takes place, and a fatal issue very frequently results, soon after delivery. Other acute diseases, as inflammations of any of the viscera, although occurring less frequently in pregnant than in other females, are also attended by much increased risk, not only of abortion, but even of dissolution; although the danger is upon the whole not so great from these attacks as from exanthematous and malignant fevers. Hippocrates (*Aphorism.* L. v. 30.) says, that "pregnant females seized with an acute disease never recover." This inference, however, is too general, for recoveries take place, in some instances, from most of the acute maladies which

have been now enumerated, but the danger is always great, even in cases of inflammation of the respiratory organs or pleura; and it is not less so, if not even greater, when inflammation of other important or vital organs takes place during pregnancy.

58. *B.* The *Treatment* of acute maladies attacking pregnant females should be appropriate to the nature of the disease, to the pathological conditions of the case, to the progress it has made, and to the circumstances of the patient and the stage of her pregnancy. In most epidemic, or exanthematous, or febrile maladies which are not truly inflammatory, violent or perturbating remedies should be avoided; vascular depletions, the promotion of the abdominal and cutaneous excretions, and due support of the vital powers, being severally prescribed as the nature of the disease and the circumstances of the case may require. In every instance the malady should be carefully watched, remedies cautiously administered, and the various offices of the nurse assiduously performed. The numerous details which a due discussion of this subject might involve are beyond my limits. They will readily suggest themselves in practice to the observing physician, who will act in all things appropriately to the peculiar circumstances both of the disease and of the patient.

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About the eighth month, which is the most critical period, the diet is to be more contracted, and the exercise increased. If the bowels are constipated, owing to the compression of the rectum by the enlarged uterus, laxative food is to be given, such as ptisan and mallows. In the ninth month the regimen is to be of a relaxing nature, and for this purpose the tepid bath is to be frequently taken, for it has a great effect in rendering parturition easy."—*Avicenna*, Canon. l. iii. 21. 2. 2. — *Haly Abbas*, Pract. l. i. c. 19. — *Primerosius*, De Morbis Mulierum, l. iv. c. 2. — *F. Rauchinus*, Tract. duo de Morbis ante Partum, in Partu et post Partum, &c. Lugd. Bat. 8vo. 1644. — *Hertin*, In *Haller's* Biblioth. Med. Pract., vol. ii. p. 237. — *R. à Castro*, De Universa Mulierum Morborum Medicina, &c. 3tia. Ed. 4to. Hamb. 1688. — *Mauriceau*, Des Maladies des Femmes Grosses. Paris, 1824, vol. i. p. 178. — *Manning*, On Diseases of Women, p. 328. et *pluries*.— *R. Manningham*, Aphorism. 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PROSTATE GLAND — DISEASES OF. —

This gland is seldom diseased in young persons; but it is much more frequently affected after puberty, and with advancing age. It is very often diseased in old persons; and generally at this period of life its diseases are associated with those of the bladder, often also with those of the kidneys and urethra; and sometimes gravel or urinary calculi are superadded. The diseases of this gland are, 1st. Inflammatory; and, 2d, Organic or structural; certain of these latter being independent of inflammatory action, and frequently associated with other diseases of the urinary organs.

INFLAMMATIONS OF THE PROSTATE GLAND —

SYNON.: — PROSTATITIS; —*Inflammation de la prostate, Prostatite*, Fr. — *Entzündung der Vorsteherdrüse*. Germ.

CLASSIF. — III. CLASS. I. ORDER. (*Author in Preface.*)

1. DEFIN. — *Pain and heat in the perinæum extending to the anus; frequent micturation, with a scalding sensation on voiding urine; tenesmus; and sensible enlargement and heat of the gland upon examination per rectum, with symptomatic fever, and sometimes retention of urine.*

2. Inflammation of this gland may be either *acute* or *chronic*; and each may occur primarily; but the chronic is often consequent upon the acute, owing as frequently to the constitution and age of the patient, and the complications of the disease, as to any fault in the treatment. Either of these states of the disease may arise from causes common to both, and be followed by nearly the same, or the very same, organic lesions. Prostatitis, whether acute or chronic, may be the *primary* malady, and occasion diseases of other associated parts; or it may be *secondary*, or con-

secutive of these diseases, or of urinary deposits or calculi.

3. i. THE CAUSES OF PROSTATITIS are chiefly premature or excessive excitement of the sexual organs, especially manustupration; riding much on horseback, or in a carriage; sitting habitually on warm cushions, or accidentally on wet or damp cushions; a frequent or habitual neglect of due evacuations of the urine, or of the bowels; the abuse of such purgatives as irritate the rectum, as calomel, blue-pill, aloëtic preparations, &c.; frequent costiveness or constipation; dysenteric attacks; inflammations of the urethra, especially gonorrhœa, gleet, &c.; strictures of the urethra; the use of various substances recommended for the cure of gonorrhœa or gleets, especially irritating or astringent injections, and stimulating gum-resins and balsams; nutritious and highly seasoned viands; excessive use of spirituous and vinous liquors; or of strong coffee; aphrodisiac substances, especially cantharides taken internally or applied externally; exposure of the lower extremities to cold or wet, especially if the individual be of the gouty, gravelly, or rheumatic diathesis; catarrh or inflammation of the urinary bladder; morbid secretions from diseased kidneys; the irritation or pressure of calculi in the bladder; the irritation of worms in the rectum; and injuries sustained in or near the perinæum and anus. Either of these causes may develope the disease, especially during advancing age, and in persons who are addicted to venereal excesses.

4. ii. SYMPTOMS. — *A. Acute Prostatitis* is attended by increasing heat and pain in the perinæum, that extend to the anus. Micturition is frequent, and accompanied with pain and scalding upon passing the urine, these sensations being increased "as the *accelerators urinæ* contract to expel the last drops of urine." Mr. COULSON accurately observes, that evacuations from the bowels cause great uneasiness; and there often remains a sensation as if the rectum was not completely emptied, giving rise to distressing tenesmus. Upon making an examination *per rectum*, "the prostate is felt as a smooth, round and hard body, projecting downward on the bowel," which feels hot; and pressure on the gland is exceedingly painful. If a catheter or sound be attempted to be introduced, it passes without difficulty as far as the membranous part of the urethra; but its passage onwards is attended by acute pain; and severe spasmodic contractions. The above symptoms are aggravated by sitting, standing, or riding on horseback, or in a carriage, or by exercise or exertion of any kind, and by the use of heating or stimulating beverages.

5. When resolution takes place, the above symptoms subside; but, if the inflammatory action continues unchecked, the inflammation extends to the neck of the bladder, or even further, and, with the tumefaction of the gland, gives rise to *retention of urine*. In this case, the febrile symptoms are remarkably exacerbated; and if retention be prolonged, delirium, followed by coma, owing to excrementitious plethora, may result, if the inflammation be not subdued or the bladder emptied.

6. When rigors occur, with increase of the febrile symptoms, quickened pulse, hot skin, and furred tongue, especially toward the evening; with a sense of fulness, tension, or throbbing in the perinæum; and with more frequent calls and increased difficulty of micturition, the existence of suppuration may be inferred. Mr. COULSON states, that if the prostate be now examined through the rectum, it will no longer be found hard and resisting, but resembling a distended bladder. The examination, as well as the discharge of fæces, causes great pain, and there is constant tenesmus with a sense of burning. The fibrous investment of the gland, softened by inflammation and distended by pus, sometimes exudes a creamy and sanguinous matter into the urethra, the rectum, or the bladder; and then the tumour subsides, the urethra becoming free, the bladder emptying itself, and the symptoms abating. If the abscess opens into the urethra, the evacuation of urine is preceded or followed by a copious discharge of purulent matter by this passage. Mr. COULSON remarks, that in some cases more or less blood is mixed with the discharge, and that he has known a considerable hæmorrhage to take place. After the last drops of urine are voided, there is a stinging pain which lasts for a few minutes, or for a longer period; and there is also a burning pain in the glans penis.

7. *B. Chronic inflammation of the prostate gland* is sometimes a consequence of the acute state of prostatitis, especially when the inflammatory action is only partially subdued, and not entirely removed. It is occasionally, also, a reproduction of the morbid action in a milder and slower form, in consequence of the influence of one or more of the causes, during, or soon after the subsidence of the acute attack. The prolongation of the inflammation in a chronic form, after the acute symptoms are subdued, is often owing to the gouty or rheumatic, or scrofulous diathesis, to gravelly or calculous formations, to the use of stimulating beverages, and to venereal indulgences. Mr. COULSON remarks, that sometimes, in feeble subjects, the antiphlogistic treatment stops the progress of the inflammation at a period of the disease when pus has already formed in the prostate, but has not effected its discharge. Infiltrating the cellular tissue connecting the lobes of the gland and surrounding parts, or contained in small abscesses, this purulent matter becomes more consistent by the absorption of its more fluid parts, and gives rise to cheese-like or tubercular formations, which excite slight attacks of inflammation with increased deposition and bulk of the gland.

8. More frequently, however, chronic prostatitis commences primarily, and the gland assumes an enlarged, and sometimes an indurated state, owing to the absorption of the more fluid portions of the serum and lymph deposited by inflammatory action into the cells of the connecting cellular tissue. Each exacerbation of the morbid action is thus followed by increased symptoms and size of the gland.

9. The *symptoms* of chronic prostatitis thus vary with the mode in which the disease commences and proceeds. In the *consecutive form* (§ 7.) they are merely the protracted continuance of a milder state of the symptoms that existed during the acute stage, either after intermissions or without, or with remissions of varying duration. When chronic prostatitis is *primary*, it is often long neglected, owing to the gradual increase of the inconvenience, and to the symptoms

being mistaken for those of internal piles, until difficulty of micturition suggests the origin of the evil. When the gland becomes enlarged from the continuance of inflammatory irritation, the patient has a sense of weight and bearing down, and a desire to go to stool, although the rectum is empty. The urine is voided every hour, or oftener, although but little has collected, and so slowly that it drops or dribbles merely from the orifice of the urethra; slight pain being felt in the glans penis, and course of the urethra. The symptoms are increased by riding, walking, or standing, and are attended by symptomatic pains in the loins or down the thighs. There are generally, also, constipation, and dyspepsia; sometimes headach, or scaly eruptions on the skin; and occasionally, slight hemorrhage from the urethra. The increased size of the prostate always interferes, more or less, with the exercise of the functions of the urinary bladder. The inability to discharge, readily, the contents of the bladder, owing to the impediment produced by the increased size of the gland, and by the associated changes in, or near the neck of the viscus, is the chief, and the most serious effect of this disease. If, after exertions to empty the bladder, an ounce or two of urine are left in it, the desire to micturate quickly returns, and renewed efforts are made in vain to expel it. This distressing symptom is much increased by exposure to cold, or wet, by irregularity of diet, by stimulating liquors, and by constipation of the bowels. Sometimes instead of retention, there is incontinence of urine; or during sleep, the urine passes involuntarily.

10. Chronic inflammation, or *enlargement* of the prostate, with, or without *induration*, is generally a disease of middle life, or aged persons; but has also been met with in the young, chiefly in those who have been addicted to self-pollution. In these, as well as in other circumstances, the mucous follicles increase in size, and the surrounding cellular tissue becomes thickened, the prostate being thereby considerably enlarged, and the desire and difficulty of passing urine proportionably augmented. When the gland becomes so far enlarged as to prevent the entire evacuation of the urine, the retained portion becomes ammoniacal; pain and numbness are felt in the *glans penis*; sense of weight or uneasiness in the perinæum; pain in the back of one or both thighs, in the loins and in the sciatic nerves; and the fæces are flattened. In aged, or middle-aged persons, the enlargement is often *complicated* with *hæmorrhoids*, or *prolapsus ani*, and sometimes with both. The ammoniacal smell of the urine becomes more offensive as the disease advances; and the urine, occasionally, is white and milky, owing, in some measure, to the extension of inflammation to the internal surface of the bladder. If, however, the urine be retained, it presents the appearance of coffee, occasioned by the admixture of blood with it.

11. Sir B. BRODIE remarks that with far advanced age, "the prostate usually, perhaps invariably becomes enlarged." This change takes place slowly and at first imperceptibly; and the term chronic enlargement is not improperly employed to distinguish it from the inflammatory attacks to which the prostate is liable in early life. It may in some respects be compared with the chronic enlargement of the thyroid gland, known by the name of bronchocele. Like the latter it is generally slow in its progress, and often, after having reached a certain point, it remains stationary for many years, if proper treatment be adopted. It rarely terminates in ulceration or in abscess.

12. *Upon dissection*, the prostate is found enlarged sometimes laterally, but most frequently in the middle or third lobe. Enlargement of the lateral lobes has existed to a very great extent without having occasioned retention of urine; but even moderate enlargement of the third or middle lobe may occasion retention; for, being situated immediately behind the orifice of the urethra, the urine behind the tumour formed by it presses it against the orifice, and it thus obstructs the passage. Sir B. BRODIE remarks that the tumour of the third lobe varies in size from a horse-bean to an orange. When small it is of a conical shape, with the apex projecting into the bladder, and the base continued into the gland; but, when large, the base is often the narrowest part. In some instances there is another tumour also projecting into the bladder, formed by one of the lateral portions. The canal of the urethra where it passes through the enlarged prostate is generally flattened. Not infrequently the enlargement so alters the direction of the urethra, that, instead of pursuing a straight course through the gland it is inclined first to one side and then to the other. The urethra is, in some cases, narrowed by the enlarged gland; but in others it is wider, and even dilated into a kind of sinus where it lies in the centre of the prostate.

13. iii. THE DIAGNOSIS of enlargement of the prostate is determined by examination per rectum and by the introduction of a bougie or catheter into the urethra. The former mode, however, although it will furnish evidence of the existence of enlargement, may not determine the presence of enlargement of the middle lobe. The introduction of the catheter will, however, soon settle the question as to disease of this lobe. The symptoms of retention of urine from enlarged prostate are not very different from those caused by stricture, but Sir B. BRODIE remarks that the terminations are different. He has never seen a case in which the bladder has given way in the former, as sometimes happens in the latter state of retention.

14. iv. THE PROGNOSIS.—*A. Of acute Prostatitis* depends upon the progress of the disease and the age and other circumstances of the patient. At an early stage of the disease and before the symptoms of suppuration have appeared, if the health of the patient be not otherwise bad, a favourable prognosis may be given; but in the aged, in a constitution exhausted by excesses; and especially if symptoms of abscess be present, a guarded or an unfavourable opinion should be entertained of the result. When the pain is throbbing, is attended by shivering, and the disease has passed eight days either unsubdued by treatment or neglected, then suppuration has generally commenced, and probably advanced through the connecting cellular tissue; and in this case the patient often ultimately sinks, either one or several abscesses being formed, which may open into the urethra, or into the rectum, or through the fascia, cellular tissue, and perinæum. But the abscesses may burrow and form fistulous

passages, and cause wasting suppuration. An unfavourable issue may occur before the abscess makes for itself an exit, owing to the retention of urine produced by it, and to consequent excrementitious plethora, causing fatal coma or apoplexy. This, however, will rarely occur when the patient receives medical aid. If the abscess opens into the urethra or rectum, the infiltration of excrementitious fluids through the orifice will rapidly aggravate the symptoms and accelerate the result. When the matter is early evacuated per perinæum, recovery may be expected, if other circumstances be favourable or the disease be uncomplicated, no serious disease of the kidneys or bladder being associated with it.

15. *B. The Prognosis of Chronic inflammation and enlargement of the prostate gland* is always unfavourable. When the patient is not very far advanced in age, and the constitution is otherwise not materially impaired, then the enlargement and hardening may sometimes be reduced, especially when the disease has not been of very long duration. But in advanced age, in weakened constitutions, and when the disease is associated with inflammation or structural lesions of the bladder or of the kidneys, little hope of recovery can be entertained, although life may be prolonged for a considerable time, if the complication be not of a very severe or dangerous nature, by careful treatment and regimen. Mr. COULSON observes that "tumefactions of the prostate which are brought on by strictures, disappear when these are cured: it is necessary, therefore, to distinguish them from more permanent disease."

16. v. COMPLICATIONS. — Acute, as well as chronic prostatitis with more or less enlargement of the gland is not infrequently associated with one or other of the following affections; — with the gravelly, especially the phosphatic diathesis; with calculous concretions in the bladder or kidneys; with irritable, inflammatory, and thickened states of the bladder; with hæmorrhoids or prolapsus ani; with gonorrhœa or gleet; or with stricture of the urethra. In the more chronic states of inflammatory action of this gland, and especially when the enlargement and induration are considerable, one or other, or even more than one of these complications, is often observed.

17. vi. TREATMENT. — *A.* In *acute prostatitis*, before symptoms of suppuration appear, the treatment should be strictly antiphlogistic, and consist of the application of leeches, or of cupping over the perinæum; of cooling diaphoretics, especially the liquor antimonii tartarizati, with liquor ammoniæ acetatis and spiritus ætheris nitrici, in camphor water; of Dover's powder at bed-time; of cooling saline aperients, and cooling lavement in the morning; and of farinaceous or vegetable diet. If there be much heat about the anus, a frequent injection of a cold fluid and cooling lotions to the perinæum and anus will be of use. And, in such cases more especially, the patient should recline on a horse-hair sofa, or sit upon an open cane-bottomed chair. The patient's beverages should be diluent and demulcent, and all stimulating and heating food and drink ought to be avoided. If retention of urine be threatened, owing to the swelling of the gland or of the middle lobe, and if cold enemata and cold lotions have failed, the hip-bath, demulcent and soothing clysters, and fomentations or poultices to the perinæum may be resorted to. But, until these and the foregoing means fail, the introduction of instruments should not be attempted. When recourse to these is required, the able advice given by the surgical writers referred to in the *Bibliography* should be adopted.

18. *B.* If *suppuration* has commenced, Sir B. BRODIE and Mr. COULSON advise an early external discharge for the matter, in order to prevent it bursting into the urethra. The early and free puncture of the perinæum down to the gland, save where little or no matter has yet formed, is generally useful, by the loss of blood, and the removal of the tension of the parts. If the disease have anticipated the operator, and the abscess have opened into the rectum or urethra, then the general health should be maintained. If it have burst into the latter canal, then a flexible catheter ought to be retained in the bladder, and such other means as the peculiarities of the case may require, aided by surgical assistance, ought to be adopted.

19. *C. Chronic Inflammation and enlargement of the prostate* require at first small but repeated local depletions from the perinæum; abstinence from venereal indulgences; rest in the horizontal posture, and sleeping on a hair mattress; a farinaceous and vegetable diet, with cooling and demulcent diluents, and a gently open state of the bowels, procured by means of cooling aperients, as the confection of senna with magnesia, or bi-tartrate of potash, or with sulphur. These means will be often of service, if persevered in for some time. If these fail, emollient injections, with henbane or syrup of popies; or suppositories with henbane or hemlock; or the local applications of ointments containing the iodide of potassium, as advised by Mr. STAFFORD; and the internal administration of the iodide of potassium with liquor potassæ in camphor-water, or in mucilaginous or demulcent fluids, or with sarsaparilla; or the tincture of the sesquichloride of iron, taken in the infusion of calumba or of quassia, when the disease is associated with the phosphatic diathesis, or the hydrochlorate of ammonia in gradually increased doses, may severally prove of some service. Blisters and issues to the perinæum, mercurial ointments, camphorated and volatile liniments, anodyne, and narcotic suppositories, have likewise been recommended. The judicious employment of these may either prevent the accession of, or relieve, or even remove, retention of urine. But when these fail, recourse to surgical aid ought not to be delayed; and for opinions as to the employment of surgical means, I refer the reader to the works enumerated below.

II. ORGANIC LESIONS OF THE PROSTATE GLAND.
CLASSIF. — IV. CLASS. IV. ORDER.
(*See Preface.*)

DEFIN. — *Changes of structure of the prostate gland, of various kinds, resulting generally from prolonged vascular excitement, or functional or nervous irritation, causing disorder of, or obstruction to, the urinary excretion, and often associated with other affections of the urinary organs and rectum.*

20. i. The most frequent ORGANIC LESIONS of this gland are ENLARGEMENT and INDURATION consequent upon chronic inflammation. — *a.* But these changes may take place independently of any actual inflammatory action, frequent func-

tional excitement consequent upon entertaining prurient ideas, or upon frequently practised self-pollutions or other venereal excesses, often occasioning these lesions independently, as well as in consequence, of inflammatory action either acute or chronic. There is every reason moreover to infer that sexual desires and frequent excitement of the genitals are attended by more or less active congestion of the prostate, with or without increased prostate secretion, which, if continued habitually for a long period, will pass into enlargement and induration, and often occasion obstruction to the excretion of urine. M. VELPEAU notices, by the appellation of "*Catarrh of the prostate*," an increased flow of the prostatic secretion, arising from prolonged gonorrhœa or gleet, or frequent attacks of these, and appearing chiefly when the patient has been to stool, or has passed his urine. Although sometimes supervening upon inflammatory states of the urethra, this morbidly increased secretion is more frequent after habitual self-pollutions and sexual excitement, and is attended by congestion or active determination of blood to the gland with more or less enlargement, and with several of the symptoms of prostatitis in a slight degree.

21. *b.* Swelling or enlargement of the gland *from a varicose state of the vessels*, mentioned by CHELIUS, is merely a form of congestive or non-inflammatory enlargement. It generally occurs slowly in old persons, after venereal excesses, after repeated attacks of gonorrhœa or gleet, after hæmorrhoidal complaints and constipated bowels, and after abuses of stimulating liquors. It is met with most commonly in the sedentary and those who live richly; the difficulty of emptying the bladder increasing, and becoming great, especially after violent exertion, and after heating food and drink. The swollen prostate is felt *per rectum*, but it is free from pain, and there is no pain in the passage of urine through the urethra. "The varicosity is situated rather in the coverings of the prostate. The substance of the gland itself is sometimes soft and spongy, sometimes tense and hard."

22. *c.* The *treatment* of these states of enlargement of the prostate depends much upon the evidence of their source. If they be consequent upon congestion or active determination to the organ, and if the constitution be not remarkably impaired, local depletions should be prescribed. Clysters of cold water, or of the decoction of oak-bark, with alum; attentive regulation of the bowels; and a cautious use of the catheter, with the other means suggested for the removal of the chronic states of prostatitis, are generally of service (§ 19.).

23. ii. TUBERCULAR DEPOSITS IN THE PROSTATE, and small puriform collections disseminated through the gland, are mentioned by M. VELPEAU as having been, in rare instances, observed by him; and attended by more or less swelling. They may go on to ulceration or abscess, and terminate in fistulous communications with the urethra or rectum.—*a.* Dr. BAILLIE has also observed *scrofulous disease* of this gland, as, upon dividing it, a white curdy matter has been found in it; and scrofulous pus has been forced out of its ducts. Mr. WILSON states, that he has seen the prostate enlarged and changed into a white curdy matter, precisely the same in quality as that formed in a scrofulous absorbent gland. Mr. GUTHRIE has met with a case in which the enlargement caused by scrofulous deposits or suppuration of the prostate was remarkably great. It is probable that these scrofulous changes are merely the results of sub-acute or chronic inflammation of the gland, occurring in scrofulous subjects, and giving rise to the formation of scrofulous pus, in the form either of small deposits, or of larger collections, which become more or less altered by the absorption of their more watery parts, or by the occurrence of consecutive irritation and softening.

24. Mr. WILSON states, that scrofulous swellings of the prostate are usually found in persons not advanced beyond the middle period of life; that they are slow in their progress, and not attended by much pain; that they may be felt *per anum*; and that their effects upon the excretion of urine depend upon the size and form they assume.

25. *b.* The *treatment* of scrofulous enlargements of the prostate consists chiefly in the use of the iodide of potassium with liquor potassæ and sarsaparilla; of sea-water, or of cold water with salt dissolved in it, topically, and occasionally as a clyster; of sea-bathing and sea-air; and of the application of an ointment of the iodide of potassium to the gland, in the manner recommended and explained by Mr. STAFFORD.

26. iii. ULCERATION OF THE PROSTATE is sometimes observed.—*a.* It rarely occurs in the anal aspect or surface of the gland, unless as a consequence of the extension of ulceration, or of cancer of the rectum. It is not infrequently seen in the urethral surface of the gland, sometimes near the bladder, but oftener near to, or on the *verumontanum itself*. Ulceration is a consequence generally of scrofulous disease of the prostate, or of purulent formations, or of injuries occasioned by bougies or catheters.

27. *b.* The *diagnosis* of ulceration of the prostate is very obscure. The appearance of blood on a bougie, or after micturition; the existence of pain in the situation of the gland, and the acute exacerbation of pain upon the passage of a bougie, and upon micturition, will suggest the probable existence of ulceration, but by no means prove it; inasmuch as these symptoms attend inflammation of either the prostate itself, or of the prostatic portion of the urethra.

28. *c.* The *treatment* which these symptoms suggest will depend upon, and vary with, the circumstances of the case, but it will not be materially different from what has been recommended above for the consequences of *prostatitis* (§§ 18, 19.).

29. iv. HÆMORRHAGE FROM THE PROSTATE may occur from ulceration, from the opening made by an abscess, from the accidental rupture of vessels, or from injury by a catheter. In these, the hæmorrhage is rarely very great, and the blood passes by the urethra. But, when it is excessive, it may flow into the bladder, where its presence, especially its coagula, always occasions distress. In a case published by Mr. COPLAND HUTCHISON, the bladder was suddenly filled with blood, which proceeded from "two *fungoid tumours* which projected into this viscus from the prostate gland." The bladder was perfectly healthy. The entrance of the urethra was situated between the two tumours; the left being

about the size of a hen's egg, and the other that of a walnut. (*Lond. Med. Repos.* vol. xxii. p. 130.) The *treatment* of hæmorrhage from the prostate does not differ from that advised for hæmorrhage from the urinary passages. (See art. HÆMORRHAGE, § 215.)

30. v. FUNGO-ENCEPHALOID DISEASE AND CANCER have been met with in the prostate. — *A.* In the former, either the fungoid or the encephaloid structure may predominate. This form of malignant disease may be primary and solitary, as in an interesting case recorded by Mr. STAFFORD; or it may be a part only of a more general manifestation of this malady.

31. *B. Carcinoma*, or scirrho-cancer, of this gland is rarely seen; but the prostate may be implicated in scirrhus, or cancer of the rectum. It is rare that scirrhus of the prostate occurs primarily, or in an uncomplicated form. Sir B. BRODIE, however, has adduced cases in which scirrhus appears to have affected this gland primarily.

32. *C.* When fungo-encephaloid malignant disease is seated in the prostate, there is not only great enlargement and retention of urine, but also an elastic or soft tumour felt *per anum*, sometimes with hæmorrhage from the urethra, following efforts to pass urine. A scirrhous state of the gland is indicated by acute intermitting pains in the prostatic region, unconnected with the excretion of urine, and enlargement with a stony hardness of the prostate felt *per anum*, in addition to the usual symptoms of chronic enlargement.

33. vi. CALCULI IN THE PROSTATE.—The calculi found in the cavities of the prostate have been too generally viewed as quite different from those formed in the bladder, and as being altogether similar to those concretions sometimes found in the salivary ducts and elsewhere. It is not improbable that, whilst there are some which thus originate, there are others which are formed chiefly from urinary deposits; or which, originating in the gland itself, become greatly enlarged by urinary deposits, the prostatic calculi being only the nuclei around which these deposits are formed. It should be recollected that, when there is obstruction to the passage of urine through the urethra owing to stricture, the prostate gland is then sometimes seen with its follicular cavities very much widened, and its ducts dilated; the latter being even as much enlarged as to admit of the introduction of a crow-quill. When, therefore, the urine is prevented from passing by stricture, or passes only in small quantity, some of it is forced into the ducts and cavities of the gland, which thereby become enlarged, the muscular coat of the bladder being also gradually thickened. In these circumstances, if prostatic calculi exist, they will readily increase, owing to the passage of urine over them, or the stagnation of it around them. But when the ducts and cavity become thus dilated, and admit the urine during efforts to expel it, the calculi may actually form in the prostate from the urine thus propelled into and accumulated in the cavities of the gland. I consider that calculi may form in the prostate, or be found either altogether or partly in it, as follows: — 1st. They may form in the gland, or in its ducts, independently of any access of the urine, or deposit from this excretion; and, in this case, they are small and numerous, consisting chiefly of the carbonate or the phosphate of lime, with a large proportion of animal matter: — 2d. Calculi may form in the ducts and cavities of the gland consecutively of stricture of the urethra, owing to the passage into and stagnation of urine within these parts, as shown above; and may afterwards increase so as to be partially external to the gland: in this case they may be similar, in chemical constitution, to other urinary calculi, according to the existing calculous diathesis, and may reach a large size: — 3d. They may originate in the first of these modes, and subsequently increase greatly in size, owing to urinary deposit, as in the second mode: — 4th. Fragments of calculi may escape into dilated prostatic ducts or cavities after lithotomy, or small gravelly calculi may pass into the ducts independently of this operation, where they may increase, as in the second mode of formation.

34. The *first*, or true prostatic calculi vary in size from that of a pin's head to that of a pea, and in number from eight, ten, or twelve, to forty or fifty. They are often attended by little inconvenience until they obstruct the excretion of urine; but in rare instances, they occasion distressing irritation and excitement. Two remarkable cases of prostatic calculi are reported by Dr. HERBERT BARKER (*Trans. of Provin. Med. and Surg. Assoc. N. S.*, vol. ii.), and by Prof. FERGUSSON (*Lond. Med. Gaz.*, 7 Jan. 1848). The calculous deposit was most probably formed, in these cases, in the *second* of the modes now pointed out. Indeed, Professor FERGUSSON mentioned to me, that this was the probable mode of their formation in the case operated upon by him, as they were preceded by stricture of the urethra. Dr. PROUT believes that the larger calculi, which are smooth and polished, and have a porcelain-like appearance, always originate in abscess of the prostate, but it will be found, that they are formed in the cavities of the prostate consecutively of stricture of the urethra, as shown above.

35. Dr. CROSSE, of Norwich, remarks that, "it is only when large or numerous in one large cyst, or projecting into the urethra, that prostatic concretions give rise to the symptoms of stone; frequent painful micturition, and discharge of mucus from inflammation of the urethra and neck of the bladder. They seem to be sufficiently often combined with stone in the bladder to lead us to suspect that the one disease contributes to the production of the other; and, indeed, I consider that urinary calculi, stricture of the urethra, or whatever other diseases here situated, causing inflammation of the prostatic part of the urethra, and interrupting the free exit of the excretion of the prostatic ducts, dispose to the formation of calculi of this description." These observations, by so learned and experienced a surgeon, show the connection I have contended for; whilst his subsequent remarks indicate, that the *third mode* in which I have viewed the formation of those calculi (§ 33.), is one to which he most justly attaches great importance, although he generalises more in respect of them than agrees with my views. "A distinction to be kept in mind in respect of prostatic calculi, is," Dr. CROSSE observes, "that they are not urinary concretions, but are formed and may increase without the urine having access to them; they may, notwith-

standing, rise to the orifice of the prostatic ducts, or get into, or be detained in, the urethra, or pass retrograde into the bladder, becoming the nuclei around which deposits from the urine take place." This is one of the modes of formation which I have enumerated, and I could not have an abler authority upon which I might found my views.

36. *B. The Diagnosis of prostatic calculi* is seldom very clear, unless the calculi are large or numerous, or project into the urethra or bladder. Mr. Coulson justly observes, that "a retention of urine or pain about the neck of the bladder, and frequent desire to make water, are sometimes the only symptoms; and these are common to several other affections of the prostate gland and urethra." *Per anum* the gland may be felt to be enlarged; and, in some instances, the calculi may, by their number, form, or size, furnish sufficient evidence of their presence, as in a case mentioned by Dr. Marcet, where they could be plainly felt through the coats of the rectum. When the calculi project from the gland into the urethra, the sound will strike against it; but it will still be a question whether or no the calculus be one which has passed out of the bladder into the urethra. The history of the case, and the existence, previously and at the time of symptoms referable to the prostate will be the chief guides to a diagnosis. When they strike or grate against an instrument they will occasion sensations in both the prostate and perinæum, and in the *glans penis*, which will indicate their nature. When very large or numerous, they may be felt, as if in a cyst, *per anum*, or they may protrude so as to be felt in the perinæum.

37. *C. Treatment.*—When severe symptoms are produced by prostatic calculi, then dysury, stricture, sacculi, inflammation and thickening of the coats of the bladder all ensue; and in extreme cases, and when it is fully ascertained upon the requisite examinations that large or numerous prostatic calculi are present, it will be right, as advised by Dr. Crosse, to cut down to the prostatic gland from the perinæum, as in the lateral method of litho-cystotomy, and to remove the concretions. An interesting case, recorded by Mr. Coulson (*Op. Cit.* p. 273.), will further illustrate the treatment, which is entirely surgical; and to this, as well as to the remarks of other eminent writers noticed in the *Bibliography*, I must refer the reader.

38. vii. Concretions formed in the Veins, *about the prostate gland and neck of the bladder*, have been noticed by Meckel, Tiedemann, Otto, Lobstein, and Crosse. The last named author states, that "in aged persons, particularly with hypertrophy of the prostate, a bladder diseased, and the veins about it and the rectum varicose, concretions of phosphate of lime, or carbonate of lime, varying in size from a pin's head to a kidney-bean, are often found in the veins." Sometimes they present the appearance of a white pea, and an inequality or projection answering to the part by which they adhered to the vessel. These concretions have no connection with urinary or other excretions, and are merely growths or concretions which had been adherent to the coats of the vein. They approach nearer to ossific than to calculous concretions.—(Crosse, *Op. Cit. passim.*)

39. viii. The Complications of organic lesions of the prostatic gland are those already noticed (§ 16.), especially inflammation and thickening of the coats of the bladder; structural lesions of the kidneys, stricture of the urethra, gleets and gonorrhœa; involuntary pollutions; the several diseases of the rectum, particularly hæmorrhoids, prolapsus ani, stricture or scirrhus; constipation and various affections of the colon, hæmorrhage from the urinary bladder, or from the urethra, or from the rectum, and intestinal worms.

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PRURIGO.—Synon.—*Cnesmos* (χνησμὸς, Galen); — *Pruritus, Scabies papuliformis*, Auct.; *Exormia Prurigo*, Good; — *das Jucken, jeukte*, Germ.

Classif. — 6th *Class*, 3d *Order* (Good); — 1st *Order*, 3d *Genus* (Willan); — III. Class, I. Order (*Author in Preface*).

1. Defin. — *An eruption of papulæ, larger than those of lichen, not materially differing from the colour of the skin; attended by excessive heat and pungent itching; becoming covered with small black scabs when scratched or abraded; leaving behind them yellowish stains; very chronic in duration, but not contagious, and generally unattended by fever.*

2. This eruption generally appears about the neck and shoulders, and sometimes extends to the face, trunk, and limbs, more especially to the back; and to the outer sides of the arms and thighs, in the line of extension, and assumes a severe character. It is occasionally confined to a single spot. Its mildest forms may decline in the course of three or four weeks; but much more frequently it continues several months, or even years, and is attended by a burning and intolerable itching. Willan has distinguished *three varieties* which may be modified in certain localities, or be limited to these localities, thus assuming *three local forms*. The *varieties*, according to Willan and other writers, are *Prurigo Mitis*, *P. Formicans*, and *P. Senilis*. The first and second differ from each other merely in degree; there being no fundamental distinction between them. The third variety has some peculiar characters.

3. I. Description. — i. *Prurigo mitis* appears in the form of small and slightly prominent papulæ,

broader than those of lichen, soft and smooth to the touch, and of the same colour as the skin. They are attended by incessant itching, which is greatly increased upon the removal of the clothes, by changes of temperature, by the warmth of bed, and by exercise. When left to themselves, or not aggravated by scratching, or by a heating regimen, they subside, with a slight exfoliation of the epidermis; but more commonly the relief of the pruritus attempted by scratching causes the removal of the tops of the papulæ, which then become covered by a small characteristic black scab, formed by the drying of a minute exudation of blood on the abraded spot. If the papulæ be much irritated, ecthymatous pustules are sometimes developed. This form of the eruption is most frequent in the spring and summer months in the situations above mentioned (§ 2.). It is often preceded by slight disorder of the digestive and excreting functions, especially of the latter, and occasionally by slight acceleration of pulse; but these are usually overlooked. The mildest cases may terminate in about three weeks; but more frequently fresh papulæ appear as the preceding vanish, and the eruption may thus be prolonged for several months.

4. ii. *Prurigo Formicans* is merely a severer form of the preceding. The papulæ are, however, generally larger — broader and more prominent, yet flat. They are distinct, nearly of the colour of the skin, if not torn by the nails, and commonly seated on the neck, back, loins, and external aspect of the limbs; although they may appear also on other parts. They are sometimes very numerous in young subjects. The itching is more severe and pungent than in the first variety, resembles the gnawing of innumerable ants, or the prickings of hot needles, and is increased towards evening by the heat of bed, and by the circumstances already noticed. RAYER remarks, that patients describing their feelings liken them to burning fires, and maddening itchings. ALIBERT says that PLATO, CHARLES V., CHARLES IX., and other great men, were afflicted with this eruption; and that the Abbé MORELLET, at the age of eighty, expressed himself as writhing on "St. LAWRENCE's gridiron" when suffering from it. The warmth of bed sometimes increases the itching to such a pitch as to cause the patients to scratch themselves until they bleed, and as to prevent sleep until morning, or until exhaustion sinks them into it; when they often soon awake to be similarly tormented. The black scabs following the scratching are frequently the chief appearance of eruption, although redness of the skin is often produced for a short time by the scratching. The affection continues for months, and, with varying remissions or intermissions often for years, especially in weak children and adults, and in old persons. After the subsidence of the eruption the skin remains dry and thickened, and the epidermis exfoliates. This form of the complaint is generally preceded by disorder of the abdominal organs, and by slight fever, which tend to complicate and perpetuate it. Like numerous other cutaneous affections, it should be viewed as a local manifestation of disorder implicating the excreting functions and the state of the circulating fluids, and requiring a treatment directed accordingly. It may occur in both children and adults at any period of the year.

5. iii. *Prurigo Senilis*, or *senile prurigo*, closely resemble prurigo formicans; but the papulæ are harder, larger, and more confluent. It is attended by incessant and insupportable itching, and may endure for years, with varying severity. The papulæ are intermingled with small black scabs and numerous scratches caused by attempts to relieve the pruritus. In more prolonged cases the skin becomes swollen, inflamed, and as if thickened; and the affection is sometimes complicated with eruptions of vesicles, pustules, or boils, according to the constitution and regimen of the patient. Abscesses are even occasionally formed. But these external associations generally proceed from more or less marked disorder of the assimilating and excreting functions, more especially of the liver, bowels, and kidneys; with or without gastro-intestinal irritation or febrile excitement.

6. In a severe case of senile prurigo, WILLAN found a number of minute *pulices* upon the skin, and he remarked the frequent association of the *pediculus vestimentorum* with this eruption. In very old persons, or in the debilitated, when the eruption follows febrile diseases, and in those who live on poor unwholesome food, but especially in debilitated persons in the decline of life, swarms of *pediculi* not infrequently complicate this affection. There is, however, also more or less disorder of the abdominal functions; with either a poor or impure state of the circulating fluids.

7. iv. *Local Forms.* — These are merely the occurrence or limitation of prurigo — of its characteristic eruption, to certain localities, where it usually becomes severe and prolonged, and occasionally produces additional annoyance or distress. In the several localities constituting these forms, the eruption is similar to some one of the varieties already described; the locality favouring no one variety more than another. — *A. Prurigo podicis* is generally an eruption of papulæ similar to those of *P. mitis*, but more frequently to those of *P. formicans* around the anus, sometimes extending to the perinæum, between the nates and thighs. The symptoms and duration of the eruption are the same as stated above. After its long continuance the skin around the anus becomes rough, thickened, and otherwise altered. — *B. Prurigo Scroti* is merely the extension of the eruption to the scrotum, and is not further peculiar in any respect, the symptoms and sufferings being the same as in the several varieties. — *C. Prurigo Pudendalis* is seated chiefly in the *labia majora* and mucous surface of the *vulva*. It is attended by constant but varying pruritus, occasioning swelling or inflammation of the parts, sometimes with a serous exudation; and it induces sexual excitement, and self-pollution, amounting in some instances to nymphomania. This form sometimes occurs during pregnancy, and occasions much misery.

8. II. DIAGNOSIS. — Prurigo is distinguished by the absence of colour from the papulæ, and by the stinging or burning pruritus. It may, however, be confounded with *lichen* and some of the *vesicular eruptions*.—(*a.*) It is distinguished from *lichen* by the larger size of the papulæ, by the small black scabs, and by the intense burning itching. — (*b.*) Prurigo is most likely to be confounded with *scabies*, but the papulæ of prurigo are flattish and of the same colour as the skin, whilst

the vesicles are acuminated and rose-coloured. The vesicles of the latter terminate in yellow scabs, and occur in exactly opposite situations to those in which prurigo appears, namely, in the internal surfaces of the limbs and in the line of flexion. The pruritus of scabies is also much more supportable than that of prurigo.—(*c.*) Prurigo may *co-exist* with lichen, scabies, and eczema, and with the pustules of impetigo and ecthyma. It terminates by resolution or by furfuraceous desquamation.

9. III. PROGNOSIS.—Prurigo is not attended by danger in the young, robust, or otherwise healthy, although it may prove very obstinate and harassing to the patient. In debilitated, cachectic constitutions; in old and ill-fed persons; and where cleanly habits are not duly observed, it is often incurable; and if it be associated in these with visceral disease, it may tend to shorten life. In the complications especially, and particularly in those with disorder of the abdominal organs, either the suppression of the external eruption, or the development of acute disease of these organs, may be attended by severe or dangerous symptoms, especially if the eruption disappear rapidly.

10. IV. CAUSES.—The first and second varieties of prurigo occur chiefly in children and adults, and at all seasons, but more frequently in spring and summer. Senile prurigo is most common in the old, ill-fed, and in connection with an impoverished or impure state of the blood. Low and damp situations; poverty, and the want of cleanliness; unwholesome, deficient, or poor diet; the use of salt, stale, or dried, or otherwise preserved fish, or of shell-fish; heating and stimulating liquors and condiments; impaired excreting functions, especially by the liver, bowels, kidneys, and skin; the neglect of aperient or chologogue medicines, and of due evacuations; visceral disorders occasioning, or even consequent upon, the accumulation of effœte materials in the circulation; the suppression or interruption of various depurative functions, as amenorrhœa, &c.; the use of dirty clothes, or of foul woollen bed-clothes, and of foul or impure beds, stuffed with animal productions, as wool or feathers which have become contaminated by the perspiration of many years of occupation; the influence of mental emotions, and interruptions of the excreting functions, severally and in various states and forms of association and succession, occasion this and various other chronic eruptions.

11. V. TREATMENT.—In all cases, especially the more protracted, of this complaint, the state of the abdominal viscera, and of the several excretions should be closely examined, and existing disorder of these corrected or removed.—*A.* If abdominal plethora or congestion of any of the abdominal viscera be present, a moderate vascular depletion may be prescribed; and PLUMMER's pill with soap be given at bed-time, and an aperient in the morning, consisting of the electuary of senna with magnesia and milk of sulphur. A dose of a bitter infusion, as calumba or chereita, may be taken once or twice daily, with the sesquicarbonates of potash and ammonia. Having removed accumulated or morbid excretions, and promoted the discharge of effœte materials from the blood, the healthy functions of the skin should be restored by a frequent use of warm alkaline, or of soap, or of sulphur baths; and by the internal administration of sulphur with magnesia, or with an alkaline carbonate, every night, or both night and morning. When the skin is dry and rough, these baths may be alternated with vapour baths, or with baths containing the bi-borate of soda, and followed by warm baths with gelatin or mucilaginous substances, as tragacanth, two or three days being allowed to elapse after the mucilaginous baths in order to observe their effects. These last baths may likewise contain either of the alkaline sub-carbonates, from one to four ounces to each bath, according to the size and age of the patient. Where the skin is delicate and irritable, then irritating baths and applications ought to be avoided; simple warm or soap-baths, or gelatinous, emollient, or mucilaginous baths being most serviceable. If these fail, the state of the assimilative and excreting viscera should be strictly examined, in order to detect lurking disorder; for generally to this cause is the obstinacy of the complaint owing, and to it also are to be imputed the injurious and often dangerous consequences of suppressing the eruption before, or without, attending sufficiently to the states of the abdominal functions and organs.

12. Various ointments, and greasy or oily applications have been recommended for this eruption, especially those containing sulphur, the iodide of potassium, and muriate of ammonia; but independently of the unpleasantness of such applications to an extensive surface, they soon become, owing to the action of the air upon them, more or less irritating, although they may, at first, have afforded a little ease. If they be at all prescribed, they ought to be followed, in eight or ten hours, by a warm saponaceous or emollient bath. Instead of these I have generally employed a lotion with the hydrochlorate of ammonia; or a very weak solution of the bi-chloride of mercury, with or without the vinum opii, or watery extract of opium; or a solution of the sulphuret of potash; or a solution of the bi-borate of soda, or chlorate of soda or potash, or of the alkaline sub-carbonates, or diluted pyroligneous acetic acid, with the addition of creasote. These are severally beneficial; and whilst camphor-water, rose-water, or elder-flower water, may be used as the vehicles of the active agents, opium, or hydrocyanic acid may be added according to the circumstances of the case. In the more obstinate cases, I have prescribed, after due attention to the abdominal functions and organs, a weak solution of the iodide of potassium with a watery solution of opium, as a lotion, and sometimes also this iodide or the iodide of iron internally with sarsaparilla or with taraxacum, and have observed much benefit accrue from the treatment.

13. *B. The senile variety* of prurigo will generally be removed, if it be capable of removal, by the means above recommended, especially if due attention be paid to the states of the several excreting viscera, and to *diet* and *regimen*. The utmost cleanliness should be observed; and as there is often not only debility, but also anæmia, or an impoverished state of the blood, in these cases, tonics and chalybeates should be associated with carbonate of ammonia, or with either of the other alkaline carbonates in the treatment. The patient should sleep on a hair mattress; and the bowels ought to be duly regulated by means of sulphur with magnesia, or of any stomachic aperient which

may be found to agree the best, as the infusions of gentian and senna with the sesqui-carbonates of ammonia and of soda.

14. When the eruption is associated with the production of *pediculi*, a tonic treatment is more especially required, aided by cinnabar fumigations, or by frequent sulphur baths, or by lotions with the bi-chloride of mercury. A trial, in the most obstinate cases, may be given to *mineral waters*, especially when the excreting organs are torpid. The waters of *Cauterets*, or of *Bonnes*, or of *Barèges*, or of *Carlsbad*, may be taken. Of these the *Barèges* water may be preferred; but I believe the sulphureous waters of *Harrogate*, or of *Gilsland Spa*, or of *Moffat*, to be equally, if not more beneficial in this complaint; aided by warm bathing, due exercise, and appropriate diet. Whilst the *diet* is sufficiently nutritious it ought to be digestible; and fish, shell-fish; pork, veal, ham, bacon; heating condiments and rich sauces, coffee, and stimulating beverages, should be avoided.

15. *C. The local varieties* require chiefly the means already noticed.—(*a.*) *Prurigo podicis*, and *P. scroti* are often connected with chronic irritation of the rectum and of its mucous follicles, owing either to the presence of *ascarides*, or to *hæmorrhoidal affection*. In these cases, small injections of some of the lotions above mentioned into the rectum; great attention to cleanliness; the treatment, local and general, advised for these diseases; the application, by means of a sponge, of the lotions already enumerated (§ 12.), or of a weak solution of the acetate of lead with vinum opii, especially immediately after each stool; local fumigations with sulphur or cinnabar, and an occasional application of leeches, in plethoric persons, will seldom fail to remove the complaint; which, however, is very prone to recur, after neglect or errors of diet and regimen.

16. (*b.*) *Prurigo pudendalis* being sometimes occasioned by disordered catamenial functions, or by leucorrhœa, or by pregnancy, and complicated with either of these, requires an especial reference to the existence or non-existence of either. In these cases, the internal, external, and dietetic means already specified are of more or less service; but in these complications they may all fail, and the patient be reduced to a state of great misery. Treatment often fails during pregnancy, although the complaint will generally disappear after delivery. In some cases it has recurred in each pregnancy, and has even re-appeared after the change of life. The application of leeches to the vulva; cooling aperients and enemata, and cooling and detergent injections *per vaginam*, or similar lotions to the *vulva*, are commonly of use. It is not rare to find this variety associated with one or more small boils of the labia majora, and, in these cases, the lead lotion with vinum opii will remove the affection at any early stage; and poultices, or warm fomentations afford relief at a more advanced state. *Prurigo vulvæ* has generally disappeared, after the use of a lotion consisting of a saturated solution of the bi-borate of soda in rose or elder-flower water, either with or without the addition of the vinum opii, or of the pure acetic acid, or of both.

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PRURITUS — Synon. — *Hyperæsthesia cutis* — *Itching, morbid sensibility of the skin* — *Prurit, Démangeaison*, Fr.; — *das Jucken, die Reitzbarkeit*, Germ.

Classif. — III. Class. I. Order. (*Author in Preface.*).

1. Defin. — *Itching over a greater or less extent of the cutaneous surface, or limited to a particular part without any perceptible eruption, and generally symptomatic of some internal disorder.*

2. Pruritus, more or less general, is usually symptomatic of disorders of the digestive organs, or of some irritation of the digestive canal, especially intestinal worms. In these cases, the irritation of the mucous surface is propagated to, or reflected upon, the extremities of the nerves supplying the skin. The itching is often annoying, and is generally remittent; but it often continues in this form for many months. It is exacerbated by the same causes as those which increase prurigo, especially by changes of temperature, by stimulants and heating condiments, by hot spices, by opium, and by directing the attention to it. In some idiosyncrasies, various articles of diet or of medicine occasion it; and then it usually continues only for a short time. Shell-fish, or fish of any kind; smoked, dried, or preserved meats, &c. sometimes cause it. It is not infrequently a symptom of disorder of the uterine discharge, of hysteria; of the slighter states of irritation of the spinal chord or membranes, and of several eruptions.

3. i. *The local or limited states* of pruritus or itching may arise from the same causes as those now mentioned; but they much more frequently proceed from others, more immediately connected with the seat of itching. In most instances, however, of local pruritus, there is more or less functional disorder of the digestive organs, or accumulation of fæcal or excrementitial matters.—(*a.*) *Pruritus nasi* is often sympathetical of intestinal worms, and even of ascarides in the rectum, or of fæcal collections in the large bowels, or of dyspeptic disorders.—(*b.*) *Pruritus urethræ* is often a very troublesome affection. Itching of the extremity or course of the male urethra is most frequently caused by calculus or gravel in the bladder, or by irritation of the prostate gland or stricture of the urethra. In females it is connected either with calculus in the bladder, or with leucorrhœa of uterine disorder.—(*c.*) *Pruritus vulvæ* is often a most distressing affection. It is seated chiefly in the labia majora, but it frequently implicates the clitoris and nymphæ, or even extends up the vagina. It is usually caused by ascarides in the rectum, by disorder of the catamenia, by leucorrhœa, by self-pollution, and by hæmorrhoids.

It is not uncommon during the periods of puberty, and the cessation of the menses, and especially during pregnancy. — (*d.*) *Pruritus ani* is often a very troublesome and obstinate complaint, and is most annoying soon after retiring to rest. It is usually *caused* by ascarides in the rectum, by hæmorrhoids, by fistula ani, by neglect of cleanly habits, by morbid states of the intestinal secretions, especially of the mucous follicles of the rectum, and by irritation or congestions of the prostate gland and vesiculæ seminales. It is often complained of by persons of sedentary occupations and habits, and by those who sit on soft and warm cushions. The itching, although occurring independently of any visible eruption, when repeated or protracted, often occasions slight excoriations and thickening around the margin of the anus.

4. ii. *Diagnosis.* — Pruritus can be confounded only with *prurigo*, from which it is distinguished by the absence of any visible eruption, unless such redness, or excoriation as may result from scratching, and the mechanical irritation employed to remove or relieve this annoying sensation.

5. iii. *Treatment.* — This should be directed to the removal of the morbid condition of the viscera, upon which the pruritus depends. This is most effectually accomplished by occasional doses of spirits of turpentine and castor oil, and by enemata of the same, so as fully to evacuate all accumulated or morbid matters from the bowels. Afterwards the lotions I have prescribed for PRURIGO (§ 12.), especially the lead lotion with opium; diluted vinegar or lemon juice with creasote; a weak solution of bi-chloride of mercury with some hydrochlorate of ammonia; or the solution of the biborate of soda. Attention should be directed, in the treatment of the pruritus of females, to the state of the uterine functions, which ought to be duly promoted; and, when congestion of the uterine organs, or of any of the abdominal viscera is present, especially if the patient be young and plethoric, or if the parts become hot or excoriated, then local depletions, followed by hot fomentations are required. The *diet, regimen*, and *treatment*, are in most respects the same as advised for PRURIGO.

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PSOÆ MUSCLES, INFLAMMATION AND SUPPURATION OF. — SYNON. — *Psoitis*, Auct. Lat.; — *Psoite, Inflammation des Muscles lombaires*, Fr.; *Entzündung der Lendenmuskeln*, Germ.; — *Psoas abscess*; — *Lumbar abscess.*

CLASSIF. — III. CLASS. I. ORDER. (*See Preface.*)

1. DEFIN. — i. NOSOLOG. — *Pain in the loins generally on one side, commencing and existing insidiously, but often becoming severe, and extending to the hip, thigh, and knee-joint, caused by inflammation and suppuration, the pus collecting around the muscles, and descending with more or less tumour, either under* POUPART'S *ligament, or in some other direction.*

2. ii. PATHOLOG. — *Inflammation of the cellular tissues surrounding the psoæ lumbar and adjoining muscles, generally originating in caries of the bodies of the vertebræ, or in inflammation of the intervertebral substance, the muscles themselves ultimately becoming disorganized, and the purulent collection gravitating in the course of the cellular tissue, and opening or forming a tumour as above and as hereafter stated.*

3. I. THE CAUSES of *Psoas* or *lumbar abscess* are the scrofulous, the rheumatic, and the gouty diathesis; a cachectic habit of body, tubercular changes or deposits in the bodies of the vertebræ; caries of the vertebræ, especially the lumbar; inflammation of the invertebral substance; violent exertion of the lumbar muscles, external violence, severe strains, or sudden jerks or twists of the loins; currents of cold air on the back or loins; and ulcerations of the cæcum extending to the peri-cæcal cellular tissue. Caries of the dorsal or lumbar vertebræ, or inflammation of the intervertebral spaces are the most common causes of psoitis and lumbar abscess. Of nineteen cases detailed by ABERNETHY only two were independent of disease of the spine. He observes that the general opinion of surgeons, in which he entirely concurs, is that lumbar abscesses most frequently arise from diseases of the vertebræ; and they should certainly all be treated as if such were their origin.

4. II. SYMPTOMS. — *Psoitis* sometimes occurs suddenly, and the patient complains of pain in the loins, especially on one side. Walking becomes troublesome; the thighs can be neither raised nor extended without pain. The disease sometimes commences gradually, with pricking pains, which, becoming more severe, extend to the hip, and to the thigh, and even to the knee-joint. Sometimes the progress of inflammation is so insidious as hardly to be noticed, until the mischief appears in the form of a purulent collection. According to the extent of vertebral disease, and the degree of inflammation, does suppuration appear early or late; but the abscess which is formed generally assumes a *chronic* state, and is of a *symptomatic* character, as it is *consecutive* of inflammation and caries of the vertebræ. The chronic abscess, termed *psoas* or *lumbar abscess*, commonly forms in consequence of disease of the vertebræ of the back or loins. Matter is secreted around the diseased vertebræ, and then descends through the loose cellular tissue covering the muscles, along the side of the pelvis into the thigh. It may take a course towards the back, or may go in various directions either within or without the pelvis. The pus formed about the seat of caries remains there for a longer or shorter time, especially in the cellular tissue. As the pus collects and increases it forms a cyst, which descends, and lengthens as it inclines to either or to both sides of the vertebral column. As the pus accumulates it pushes onwards the lower end of the cyst, which, if it meet with any obstacle, spreads out, but contracts when pressed on by the adjoining parts, and dilates again when relieved from pressure; until it at last arrives at the place when it projects, or breaks. In the route which the purulent matter thus takes, the psoæ and other lumbar muscles are inflamed, pressed upon, partially absorbed and disorganised, owing to the extension of the inflammation and purulent infiltrations to them and their connecting cellular tissue

5. The abscess most frequently protrudes below Poupart's ligament, and it generally extends or opens at a greater or less distance from the original seat of disease. It may, however, point or open into the cæcum, into the colon, or the rectum, or in some part of the back, or in the loins just above the sacrum; or it may make its way to the hip, or the groin, and proceed even down the thigh in the direction of the large vessels. As the matter is seated behind the peritoneum, and as it generally gravitates according to the position of the body, it very rarely perforates this membrane and becomes effused into the abdominal cavity. As the purulent matter increases, and presses upon, or otherwise implicates, or even inflames, the larger veins, nerves, or arteries, so are the symptoms either of phlebitis, or of neuritis, or of artereitis, according to the situation and extent of the abscess, not infrequently superinduced, and *complicated* with the advanced progress of the disease, in addition to the primary lesion of the spine. I have repeatedly met with these complications, which have greatly aggravated the sufferings of the patient. If during its increase the abscess breaks externally, or is opened so as to admit the air, pus is discharged, at first without smell; but it subsequently becomes offensive; and the hectic symptoms more marked. The powers of the patient sink, and the stomach becomes irritable. In some cases the aperture either closes, and matter again collects, or it contracts, and remains fistulous for a considerable time.

6. III. Diagnosis.—(*a.*) During the formation of matter the patient suffers pain in the loins, and walking is painful. When the abscess is not large, the usual symptoms of suppuration may be absent, or so slight as to escape observation. Night or morning sweats, emaciation, and other hectic symptoms, however, generally appear or increase with the progress of the complaint. When the purulent collection has increased so as to form an external tumour either in the groin or in the loins, or near the anus, a movement may be perceived in it upon coughing. When the matter has gravitated towards the thigh or anus, the tumour is lessened by the recumbent posture. If the patient has suffered continued pain in the loins for four, five, or six months; if he has difficulty in extending the thigh, especially when putting his legs together; if he feels pain and tightness in the groin, and increase of pain on attempting to exert the limb, or when the psoas muscle is either put on the stretch or exerted, then this disease should be suspected, even although no external tumour has yet appeared; but if such tumour is present, there can be little doubt of its nature.

7. (*b.*) Psoas abscess, when protruding under Poupart's ligament, may, as Mr. South observes, be mistaken for *femoral hernia*, especially as it dilates on coughing, and partly subsides when the patient lies down. But it is generally of larger size than femoral rupture, and the fingers cannot be at all thrust around it, as they partially may behind the hernial sac. The chief distinctions, however, are the long continuance of pain in the loins previously to its appearance, the persistence of that pain, and the remarkable increase of pain produced by attempting to extend the thigh, especially backwards, or the entire inability to do so. "When the abscess appears in the loins, there is no difficulty in determining its character by its history, and by its dilatation on coughing. Pulsation may sometimes be communicated to it from the adjoining large vessels;" and thus it may be mistaken for aneurism, if the history of the case and the existing symptoms be not attentively investigated.

8. (*c.*) The diagnosis between psoas abscess and *disease of the hip-joint* is not always, although it is frequently, easy. It has been well pointed out by Mr. Coulson (*On Disease of the Hip-Joint*, 4to, Lond. 1837, p. 72.), and nearly as follows:—1st. In psoas disease, the patient generally complains of dull or of severe pain in the loins, which is increased by the upright posture, and by every motion of the limb, particularly on extending it: in diseased hip, there is no fixed pain in the loins; it is felt more in the vicinity of the hip, and especially in the knee:—2d. In the whole course of psoas disease there is no deviation in the natural situation of the trochanter, and no difference in the length of both limbs; in diseased hip, on the contrary, this is always the case:—3d. In psoitis and lumbar abscess, the patient cannot turn the foot of the affected side outwards, without increasing the pain; in diseased hip, the foot is generally turned outwards:—4th. On taking a deep inspiration, on coughing, crying, and in the erect posture, the fluctuating swelling either in front of the thigh or on the nates increases, and exit of matter, if the abscess be open, is facilitated; but in abscess of the hip-joint neither phenomenon is observed.

9. IV. Prognosis.—The prognosis of psoitis, especially when the inflammation has gone on to abscess, is extremely unfavourable. Professor Colles states that not one patient out of fifty recovers from it; and that, in the course of his practice, he has not known five cases in all recover. He never knew a case get well where a surgeon interfered at all with it. In my own practice, I know only of two recoveries. For these no surgical aid was required, beyond the formation of an issue in the back or loins. When psoas abscess is *complicated* with tubercles in the lungs, or with paraplegia, or with phlebitis or neuritis, instances of such complications having occurred in my practice, the case is then hopeless. I may, however, add, that psoas abscess may become complicated with hip-disease, a case of this association—the latter supervening on the former—having been under my care; or hip-disease may give rise to psoas abscess, as shown by Dr. M'Dowell.

10. V. Treatment.—This disease usually appears so insidiously, and advances so slowly, that it has proceeded, in most cases, beyond the influence of treatment before medical aid is required. When it is recognised at an early stage, and especially when the lesions of the vertebræ are not far advanced, or the inflammation consequent upon them has not given rise to much suppuration, then reasonable hopes may be entertained from the use of appropriate means. If the powers of the patient be not reduced, if there be no sign of anæmia, or of impaired vascular action and tone, the application of leeches, or cupping in the vicinity of the vertebral lesion, according to the state of the case, should be prescribed, and aided by stomachic aperients and cooling diaphoretics, with suitable attention to diet and perfect quietude. After sufficient local depletion, I have

generally directed either of the following embrocations to be applied to the back or loins by means of flannel, and renewed once in the twenty-four hours if it be found to agree; the sensations of the patient, the state of the pulse, and a careful observation of all the symptoms, guiding the physician.

No. 325. ℞ Linimenti camphoræ comp.; Linimenti terebinthinæ; Linim. saponis cum opio, āā, ʒj.; Olei cajuputi ʒj. ℥ Fiat embrocatio.

No. 326. ℞ Linimenti terebinthinæ, Linimenti camphoræ comp., āā, ℥ss.; Olei olivæ ʒiij.; Olei cajuputi ʒj. ℥ Fiat embrocatio.

11. If these embrocations fail, after local depletions and other constitutional or suitable means, to arrest the progress of the disease, open blisters in the vicinity of the part, or issues ought to be ordered, and kept freely discharging; whilst an alterative and restorative influence should be exerted on the constitution by a course either of the iodide of iron with sarsaparilla, or of the iodide of potassium and liquor potassæ, with compound tincture of bark and fluid extract of sarsa; or of the bichloride of mercury, in either the compound tincture or decoction of cinchona. I have alternated short courses of these, varying them according to circumstances, during the operation of the applications, issues, &c. advised to be applied near the diseased vertebræ, and often with marked benefit. I have prescribed iodine for this disease since 1822.

12. Several surgical writers, even ABERNETHY, COOPER, DUPUYTREN, LAWRENCE, PEARSON, CHELIUS, SOUTH, and others, have directed their attention and their treatment chiefly to the consecutive abscess. But, if the abscess be not large, if it be not complicated with paraplegia, or if it occasion no distressing symptoms, as it sometimes does, by its pressure on nervous, venous, or arterial trunks, or large branches, it should not be officiously interfered with; the external drains, &c. placed near the diseased vertebræ, the constitutional means prescribed above (§ 11.), and such other aids, as stomachic aperients, &c., as the peculiarities of the case may require, being the remedies most deserving of confidence. If these means succeed in even partially removing the spinal disease, the consecutive abscess, if not large, will either diminish or become absorbed, at least in some instances, as in two of those which have come under my care, and for which the above treatment, without opening the abscess, was pursued. In one of these cases, the treatment sometimes consisted, during the intervals between courses of the above medicines (§ 11.), chiefly of full and regular doses of either morphia or opium, which also were occasionally given with these medicines.

13. When the inflammation terminates in suppuration, and an abscess is formed, CHELIUS remarks, that the absorption of the matter may be procured in some cases, although rarely, by issues or perpetual blisters in the loins, and by general treatment, which promotes the abdominal functions and the patient's strength. DUPUYTREN observes, that these abscesses may remain for years; and the pus either be absorbed, no trace of them remaining, or, after a time, they may increase, the skin covering them becoming inflamed and giving way. In rare instances, the pus may drain away, and not be reproduced, or, after a longer or shorter time, it may be converted into adipocerous matter. These, however, are favourable terminations of rare occurrence. Much more frequently the abscess goes on increasing, either until it inflames and bursts the skin at the most prominent point, or until it opens into one of the hollow viscera, or until the distressing effects produced by it, as already adverted to, create a necessity for opening it.

14. Mr. SOUTH observes, that issues are most important aids in the treatment of psoas abscess, either before or after it has opened of itself, or been punctured; and that no circumstance should prevent a recourse to them. He advises the issue to be made on the side of the spine opposite to that where the abscess is seated. If presenting in one of the lumbar regions, the issue should be made at the outer margin of the quadratus lumborum of the opposite side; but if there be abscess in both lumbar regions, issues ought to be placed above and below them. If the swelling appear at the top of the thigh, an issue may be made on the same side, or in both sides of the spine, but never over the spine, nor over the abscess itself, for very obvious reasons. The issue should be made the size of a sixpence, with caustic potash, and it will generally enlarge to that of a shilling: one, or both, should be kept freely open and discharging, as just advised; whilst the constitutional and restorative powers ought to be promoted by the means recommended above.

15. Much difference of opinion exists as to the propriety of opening psoas or lumbar abscess, or of waiting for the self-evacuation of it. My own observation leads me to state, that there are cases for which surgical interference is either unnecessary or injurious; whilst there are others for which it may be most beneficially employed, if not for a cure, at least for the alleviation of the sufferings of the patient, and prolongation of life. When required, the opening should be made, as advised by Mr. ABERNETHY, so as entirely to prevent the entrance of air through the aperture, otherwise inflammation of the sac, increased hectic, offensive discharge, and sinking of the powers of life, will ensue. An opening thus carefully made, and subsequently managed as carefully, will often prevent those painful complications observed in the advanced course of the malady, and to which surgeons have not sufficiently adverted. The occasional inflammation and erosion of vessels adjoining the purulent collection, and the distressing symptoms which result, as well as the not unusual implication of a nervous trunk, or of some other important part, may be prevented, or even alleviated after their appearance, by opening the abscess before it has become so greatly distended as to complicate the case and increase the sufferings of the patient. Mr. SOUTH has given a good digest of surgical opinions on this topic, with his own advice, and to his translation of CHELIUS's system of surgery I refer the reader respecting it. I should, however, add, that whether the abscess be opened or not, the issues and constitutional treatment I have recommended, with opium and other aids, and alternated, modified, or changed, as circumstances may require, ought to be persisted in throughout the disease.

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PSORIASIS AND LEPRIASIS. — SYNON. —

PSORIASIS, Ψωριασις (from ψωρα, scabies, itch); *Impetigo, Scabies*, Celsus; *Impetigo*, Sennert, Plenck; *Scabies sicca*, Plater, Hoffman; *Psoriasis*, Vogel, Swediaur, Willan, Bateman; *Lepidosis psoriasis*, Young, Good; *Dartre, Dartre furfuracée*, Fr.; *Kleinaussatz*, Germ.; *Dry tetter, Dry Scall.*

LEPRIASIS, *Lepra*, Λέπρα (from λεπρὸς, scaly, rough). *Leuce, Alphos, Impetigo, Vitiligo*, Celsus; *Impetigo excorticativa*, Avicenna; *Lepra*, Sauvages, Sagar, Cullen, Willan, Young, &c.; *Lepidosis lepriasis*, Good; *Lèpre*, Fr.; *Dartre squammeuse*, Alibert; *Aussatz*, Germ.; *Scaly Leprosy, Leprous Scall.*

CLASSIF. — 4. *Class*; 8. *Order* (CULLEN). 6. *Class*; 3. *Order* (*Good*). ii. *Order*. 2. *Genus* (Willan and Bateman). III. CLASS; I. ORDER (*Author*).

1. DEFIN. — *A chronic inflammation of the skin, either limited to a particular region or extended more or less over the surface, appearing first with slight elevations, which change into scaly patches; the patches of* psoriasis *being of different sizes, not depressed in the centres, but with irregular and very slightly raised edges; those of* Lepriasis, *being generally rounded, slightly depressed in the centres, and surrounded by slightly raised and reddish circles.*

2. Both *Psoriasis* and *Lepriasis* or *Lepra*, were considered as modifications of the same disease by most of the ancients, and they are treated of by PAULUS ÆGINETA by the terms "*Leprosy and Psora.*" He states that "both these affections consist of an asperity of the skin, with pruritus or wasting of the body, having their origin from a melancholic humour. But leprosy spreads over the skin more deeply in a circular form, throwing out scales which resemble those of fishes; but psora is more superficial and variously figured, and throws out furfuraceous bodies." (*Transl. by* ADAMS, vol. ii. p. 15.) Mr. ADAMS concludes his remarks respecting the views of the ancients as to these affections as follows: — "It will be remarked that the Leuce of the Greeks, the leuce and fourth species of impetigo of CELSUS, and the albarras of most of the Arabians, are the same as the *lepra vulgaris* of Drs. WILLAN and BATEMAN; that the alphos of most of the Greek authorities and of CELSUS, and the morphia alba of most of the Arabians, correspond with the *lepra alphoides* of our English nosologists; that the melas, alphos niger, and common lepra of the Greeks, CELSUS's third species of impetigo and his melas, and the morphia nigra and impetigo of most of the Arabian translators, apply to the *lepra nigricans* of our modern arrangement; and that the psora of the Greeks, CELSUS's second species of impetigo, and the scabies of OCTAVIUS HORATIANUS, and of most of the Arabian translators comprehend both the *psoriasis* and *scabies* of WILLAN and BATEMAN. Since many of the ancient authorities speak of scabies as being infectious, they must have applied the term to the true itch, with which it is not likely, as RAYER maintains, that they were wholly unacquainted. The earlier modern writers, as those of the Schola Salernitana, PLATERIUS, GUY OF CAULIAC, and LANFRANCUS, jumble together the Latin and Arabian names, so as to produce no ordinary degree of confusion." — (*Op. Cit.* vol. ii. p. 21.)

3. I. CAUSES. — The *causes* of the several varieties of both *Psoriasis* and *Lepriasis* are the same; or the same causes are common to both these species. — *A. The predisposing causes* are chiefly hereditary conformation, the melancholic temperament, and an habitual languor and weakness of the circulation in the integuments, with dryness of the skin. These affections occur at all ages and in both sexes; but somewhat more frequently in adults and in those advanced in life. The influence of sex is not great, some writers stating that they are more frequent in females, others in males. They are both constitutional maladies, and are often connected with disordered abdominal functions, both at their origin, and in their course. They are sometimes connected with the gouty and rheumatic diathesis, and they may appear at any season, but more frequently in spring and autumn — lepriasis oftener in autumn. Prolonged or neglected dyspepsia; inattention to the states of the bowels and of the intestinal secretions and excretions; the habitual retention or accumulation of fæcal matters, improper and insufficient food; mental anxieties, and sexual excesses also predispose to these eruptions.

4. *B. The occasional exciting causes* are the use of salted, dried, smoked, or otherwise preserved meats and fish; the frequent use of shell-fish; irregularities and improprieties of diet, the use of pork or the flesh of the wild boar, bacon, hams, &c.; drinking cold fluids when the body is perspiring; vicissitudes of temperature and weather; poor, innutritious, or unwholesome food; exposure to cold or moisture, and living in low, damp cellars or localities; prolonged anxiety of mind; the frequent use of heating and stimulating food, sauces, spices, condiments, pickles, preserves, acids, or spirituous liquors; debaucheries or excesses of any kind; the want of sufficient personal cleanliness; and the irritation produced by various substances employed in several of the useful arts.

5. The *contagious* or *non-contagious nature* of these eruptions has long been a topic of dispute, especially as they appear in countries bordering upon the Mediterranean Sea. My friend and colleague, Mr. DENDY, has considered the subject very fully in his unpublished work on these maladies, which he kindly allowed me to peruse; and concludes that in this country they are not contagious. WILLAN has observed that *psoriasis*

guttata and *annulata* affect several children about the same time in large families and schools, especially those who sleep together, and the same remark is made by Mr. E. WILSON and others. The simulation of contagion must, however, arise from the constitutional predisposition to these eruptions undoubtedly existing in some families, and from the simultaneous operation of the same exciting causes. The topic, however, deserves further investigation.

6. I have observed these eruptions more frequently in unmarried than in married females. They are often dependent upon impaired digestion and assimilation, and upon equally impaired function of the skin, kidneys, and intestinal canal, the blood thereby abounding in imperfectly assimilated chyle and in effœte materials. I have seldom observed them in females, whose catamenial discharges were quite regular and sufficient, these discharges, when healthy, being manifestly depurative as respects the circulation, and no mean preventive of chronic cutaneous eruptions. Many modern pathologists have viewed both *psoriasis* and *lepriasis* as symptomatic of gastro-intestinal irritation. That there is more or less disorder of the digestive canal in most cases of both these eruptions must be admitted; but it does not strictly follow that this disorder consists of inflammatory irritation. It is generally functional, merely—a defect of function as much as disorder of function, the digestive and assimilative derangement and the cutaneous affection proceeding from the same source, viz. impaired organic nervous power, the cutaneous disorder only being the last of the series of functional and morbid changes.

7. Every *arrangement* of the scaly eruptions must necessarily be, to a certain extent, conventional, and be based on the more prominent phenomena and differences which they present. The chief points of difference have thus become the most familiar, as being the most commonly noted and represented, whilst the gradations by which the one variety and species pass into the other are so far kept out of view as to be either overlooked or unacknowledged. That this is the case more especially with the three species of scaly eruptions to which the terms of *pityriasis*, *psoriasis*, and *lepra* have been applied is not to be doubted by any one whose knowledge of them has been acquired from observation, and not from writers who have been more anxious to create distinctions than to trace resemblances. That these three species of eruption do not merely present points of resemblance in most cases, and even of identity in others, but also originate in the same or similar causes, will be further admitted. Nor are their causes only the same, their constitutional nature, their associations and their tendencies are also the same or closely similar. Still, it becomes necessary to describe those differences which may be remarked in their external characters, and which enable us to recognise as well as to classify them. The intimate connection subsisting between these eruptions is shown by the circumstance of their presenting, in some cases, the distinct features of psoriasis in one part, and in another part those of lepriasis; and it occasionally happens that pityriasis of very long duration, or the acute or inflammatory form of that species, when it becomes very chronic, assumes the form either of psoriasis or of lepra, whilst lepra of long duration often passes into the form of psoriasis inveterata. The three species of eruption, moreover, require the same constitutional and local treatment. For these and other reasons mentioned when treating of *tubercular leprosy*, or the leprosy of the Arabians and middle ages (see art. LEPROSY), I have viewed lepra as merely a species belonging to the same genus as psoriasis and pityriasis; and have treated of psoriasis and lepra in connection, their causes, pathology, and treatment being the same.*

8. II. DESCRIPTION.—i. PSORIASIS GUTTATA — SYNON. — *Lepra alphoides; Lepriasis albida*, Good; *Psoriasis discreta*, Rayer; *Dartre squammeuse orbiculaire*, Alibert; *Lepriasis guttata*, Dendy; *Guttated dry scall.*—Psoriasis, even in this the mildest of its forms, is often preceded or attended by symptoms of indigestion, lassitude and inaptitude for physical or mental exertion; but these are often so slight as to be overlooked. In this variety numbers of small, distinct, elevations or papulæ occur, sometimes appearing at first of the size of a pin's head, their summits soon becoming covered with a minute scale, of a

* My Colleague, Mr. DENDY, whose experience in the treatment of these eruptions is very great, has endeavoured to clear up the confusion, existing even down to the present day, respecting squamous diseases. He has arranged *psoriasis*, *lepra*, and the inflammatory form of *pityriasis* as *species* constituting one *genus* "*Lepriasis*," and has assigned to each species what he considers its *synonyme* in ancient and modern authorities. His views, as well as his descriptions, are most deserving attention. I give his arrangement, but I take the liberty of placing his species, "*Lepriasis furfurans*," or acute pityriasis, before the other more chronic and severe species, consisting of psoriasis and lepra.

LEPRIASIS.[1] — SYNON. — *Zaraab*, H. — *Kouba, Kuba, Alkauba*, Ar.—Λεπρα, Gr. — *Lepra*, W. — *Lepidosis lepriasis*, G. — *Scale-skin, Leprosy, Scaly leprosy.*

SPECIES I. LEPRIASIS FURFURANS. — SYNON. — *Alvarati*, Ar.—*Tinea, Porrigo, Dartre furfuracée*, Al.—*Teigne amiantacée; Pityriasis*, W.—*Pityriasis acuta*, R.

SPEC. II. LEPRIASIS GUTTATA. — SYNON. — Αλφος, Gr.— *Alphos*, C. — *Lepra alphoides; Psoriasis guttata*, W. — *Dartre squammeuse orbiculaire*, Al. — *Lepriasis albida*, G. — *Psoriasis discreta*, R. — *Guttated dry scall. Spotted leprosy.*

SPEC. III. LEPRIASIS ANNULATA. — SYNON. — *Boak; Behag*, H.—*Bohak, Bothor*, Ar. — (*Translated pearly or dull white leprosy*). — Λεπρα, Gr. — *Lepra Græcorum, vitiligo*, C. — *Lepra Vulgaris*, W. — *Dartre squammeuse arrondie*, Al. — *Psoriasis circinnatus; Lepidosis lepriasis*, G. — *Lepra; Leprosy; Greek, leprosy.*

VAR. — *Centrifugal; Crescentic; Gyrated.*

SPEC. IV. LEPRIASIS DIFFUSA. — SYNON. — *Sephat*, H.— (*Translated spreading dry scall.*) — *Sahafati*, Ar. — Ψωρα λεπρωδης, Gr.—*Scabies sicca, s. Crassa, Itch.*— *Psoriasis diffusa*, W.—*Psoriasis confluens*, R. — *Lepidosis Psoriasis*, G. — *Dry scall; Scaly tetter.*

VAR.—*Confluent*, &c.

SPEC. V. LEPRIASIS INVETERATA. — SYNON. — *Bahereth lebena*, H.—(*Trans. Plague of Leprosy*) :—*Beras begas*, Ar. — Λωβη, Gr. — *Agria.* — *Bright white leprosy.* — *Lichen agrius.* — *Pellagra.* — *Acrodynia.*— *Psoriasis inveterata*, W.—*Dartre squammeuse invétérée: Lichenoide*, Al. — *Lepriasis Candida*, G. — *Inveterate dry scall.*

VAR. — *Scabida.* — *Indurata.* — *Prominens.*

SPEC. VI. LEPRIASIS LIVIDA. — SYNON. — *Bahereth cecha*, H.—Ψωρα, Gr.—*Beras aswd*, Ar.—*Melas*, C.—*Lepra nigricans*, W. — *Lepriasis nigricans*, G — *Black albaras.* — *Black morphia.*— *Dusky or black leprosy.*

SPEC. VII. LEPRIASIS SYPHILITICA. — SYNON. — *Lepra Syphilitica, Psoriasis Syphilitica*, W. — *Syphilide pustuleuse*, Al.—*Syphilides*, R. — *Syphilitic lepra and psoriasis.* — *Scaly syphilis.*

[1] The capital letters following the synonymes represent the authorities. Al. Alibert.—Ar. Arabians.—C. Celsus.—G. Good.—Gr. Greeks.—H. Hebrews.—R. Rayer.—W. Willan.

dull white colour. These elevations are generally at first from two to three or four lines in diameter, irregularly circumscribed, and generally rounded. They increase somewhat in size, but always remain distinct, with the skin sound between them. When freed from the squamæ on their surfaces, they appear red and irritable, forming rounded spots or patches, from two to four or five lines across; and are slightly prominent, and of a brownish red hue. These patches occasionally heal, like those of lepra, from the centre to the circumference; and, in this case, they present slight depressions in the centres, and acquire a yellowish dusky tint. The scales formed on their surface are reproduced as soon as they are removed. As they decline, the patches often are transformed into segments or arcs of circles; and when quite removed the skin presents small stains of a greyish brown or yellowish hue in the spots occupied by them.

9. This variety is seldom accompanied with much pruritus, unless when the body is heated by exercise, or by stimulating or heating food and drink. It may be confined to the hairy scalp, face, trunk or extremities; or be disseminated over these regions, appearing either at once upon all of them, or upon each in succession. The patches or spots are generally irregularly disseminated, being crowded in one situation, and thinly scattered in others; but they are more numerous in the line of extension in the extremities than in that of flexion. Guttated psoriasis appears most frequently in spring and autumn, and often disappears in summer or in winter. It may thus recur for many successive years. It is not infrequent in children, and is more quickly evolved in them, often with slight fever. It is more prevalent in adults than in children and old persons. It often presents characters intermediate between psoriasis and lepra. It sometimes coexists with one of the other forms of psoriasis, and I have seen it associated with pityriasis. When it affects the fingers, it often implicates the nails.

10. ii. PSORIASIS DIFFUSA.—SYNON.— *Psoriasis Confluens*, Rayer; — *Lepidosis psoriasis*, Good; *Lepriasis diffusa*, Dendy; — *Spreading dry scall; scally tetter.*—*a.* In this variety the patches are of large size, of variable extent and irregular form. They are developed either by a number of small elevations, like the preceding variety, which run together and form one continuous patch, or by a papular roughness of a patch of the epidermis and congestion of the subjacent dermis, or by several patches, which speedily increase in size and coalesce. In each of these modes the patches may require two or three weeks to be fully formed. The surface of each is usually then of a dull red colour, rough, and slightly elevated above the surrounding skin, intersected by furrows which correspond with those of the epidermis, and often fissured by several deep chaps. The patches are covered by numerous thin epidermic scales, the removal of which is rarely followed by any fluid exudation. The eruption often assumes the characters of the guttated or discrete variety over different parts of the body, and the diffused form around the joints and extremities.

11. Diffuse psoriasis may occur in a single patch, of various sizes, or in several, and upon any part of the body; but most frequently on the fore-arms, or about the elbow and wrist, and, unlike lepra, chiefly the fleshy parts of the limbs. Its duration is always chronic; even its mildest states may continue for weeks or months, and the severest forms may remain for months or years.

12. Diffuse psoriasis, when extensive, is often preceded by symptoms of constitutional disorder; especially indigestion, costiveness, languor, and debility, which frequently subside as the eruption is developed, but which often recur. The eruption is generally attended by slight pruritus, and by pain and tenderness after the removal of the scales, or when the patches are fissured or chapped. It occurs chiefly in adults and the middle aged.

13. *b.* This variety has, in rare instances, assumed a *gyrated form*—*Psoriasis gyrata*, or that of narrow bands, or curved or tortuous lines. BIETT describes it as long, narrow, tortuous stripes, resembling worms; and sometimes bending into rings, occurring generally on the back, or trunk of the body. These stripes are covered by very delicate epidermic scales, which exfoliate and are reproduced as in the other forms of this variety. They are attended by a slight pruritus, and but little inconvenience. In very rare cases the eruption assumes an *annular form*, especially about the neck and face of delicate persons, and is very slight.

14. *c. In children*, diffuse psoriasis is occasionally seen in a sub-acute form — *Psoriasis infantilis*, WILLAN. It appears from two or three months to two or three years of age. It is more acute, is attended by more pruritus and smarting, and is much more rapid in its progress than in adults. The surface of the patches, which are often large, is intersected by numerous fissures or chaps, and often excoriated by friction; the excoriations exuding an ichorous fluid, which dries into hard scabs of considerable size. In infants and children this eruption may be attended by phlyzacious pustules, by a morbid secretion from the nostrils, by loss of the hair of the eye-brows, and the eyelashes when the forehead is affected, and by hardened elevations of a reddish hue.

15. iii. PSORIASIS INVETERATA. — SYNON. — *Lepriasis candida*, Good; — *Dartre Squammeuse lichenoide*, Alibert; — *Lepriasis inveterata*, Dendy; — *Inveterate dry Scall.* — When either discrete or confluent psoriasis has continued months, or years, or sometimes after the more inflammatory form of pityriasis has persisted long, especially when the eruption is hereditary, or occurs at an advanced age, or attacks a debilitated or shattered constitution, or is consequent upon protracted functional disorder of the digestive organs, then the eruption assumes the form thus named. It may be regarded as an aggravated form of psoriasis diffusa. Inveterate psoriasis usually extends over a large surface, occupying the most of the limbs, and of the trunk; the face, the palms of the hands, and the soles of the feet being free. The skin is thickened, congested, hot, dry, and harsh. It is stiff, fissured by deep cracks, and covered by epidermic scales and scabs, which are thrown off in great abundance. Pruritus is very troublesome in this variety, and is increased by the heat of bed and by a heating regimen. The thickening of the integuments restrains the motions of the limbs, and flexions of the joints. When the surface is abraded or excoriated by friction or otherwise, a fluid exudes which concretes into scabs. When this eruption affects the scalp the scales collect in

numbers; and when they are removed, an ichorous fœtid exudation takes place from the reddened surface. When it extends to the hands, the nails are remarkably affected; but, in some cases, I have observed the affection of the nails without the fingers being otherwise implicated, and have imputed the disease of the nails to the infection of the fluid exuded from the surface scratched by them. The constitutional disturbance may be but slight even in the severest cases; particularly in respect of febrile symptoms. But the functions of the stomach, liver, and bowels, are often languid and torpid, and the several depurating actions impaired. The duration of this variety is always prolonged and indeterminate. In old persons it continues for the rest of life.

16. LOCAL STATES OF PSORIASIS. — (*a.*) Psoriasis may occur primarily on the *hairy scalp*. But it is more frequently consequent upon the eruption in some other part, or upon neglected pityriasis. It is oftener seen in the *distinct* form; much more rarely in the *confluent*. In rare instances it has extended over nearly all the scalp, extending to the forehead in a line parallel with that of the hair. The inflammation sometimes attacks the bulbs of the hair, which become detached in the patches affected.

17. (*b.*) *The face* is rarely affected alone, the eruption generally appearing also in some other part. The patches on the face are usually red and furfuraceous, the scales being light and thin. On the *eye-brows* and *eye-lids* it appears, as every where else, by the formation of papulæ. The eye-lids become stiff, and slightly fissured or chapped, and these changes are followed, in children, by the loss of the ciliæ and the hair of the eye-brows. It rarely *affects the lips*, as true psoriasis, but generally in a form that more strictly belongs to *pityriasis*.

18. (*c.*) *Psoriasis genitalium* is not infrequent, and either the *prepuce*, or the *scrotum*, or the *labia majora vulvæ* may be the seat of the eruption. In either of these situations it presents the characters already described. It seldom appears in any of these primarily, but generally in connection with its occurrence in other situations. It may, however, be consequent upon prurigo or pruritus of these parts. In the *prepuce* this eruption is often obstinate and severe, and is sometimes attended by thickening, painful exudations of blood and fissures, and phymosis. Psoriasis in this situation may be associated with psoriasis of the *scrotum*, which is often most obstinate, and assumes the inveterate form, or with *psoriasis palmaris*. As respects the characters of the eruption, there are no differences produced by these localities. But swellings of the inguinal glands are often caused by the appearance of the eruption in these situations; and care should be taken not to confound it with venereal affections.

19. (*d.*) *Palmar psoriasis* — *Psoriasis palmaris* may be either distinct or confluent; but in either form, the elevations are generally broad; of a pale reddish hue, and the seat of much heat and itching. If the elevations are numerous they become painful, and interfere with the patient's occupations. In the confluent form the palm of the hand swells, and presents an uniform brownish red colour. As the eruption becomes more chronic, the heat and itching are less troublesome; the cuticle covering the elevations grows thicker, acquires a yellowish hue, dries up and becomes friable, and at last of a dead white on the surface of the patches. The epidermis then cracks, and is detached either spontaneously or by the nails of the patient, and leaves a new epidermis, through which the corion appears red and vascular. The epidermis surrounding the diseased patch also undergoes a change, being thicker than usual, of a dirty yellow tint, and subsequently becoming dry or mealy on the surface. It finally exfoliates irregularly, at first adjoining the older patches, and then in the flexuses of the joints and natural folds of the palm. The desquamation is always *irregular*, and very different in appearance from that of the next variety, the *psoriasis palmaris centrifuga*; but, like it, and even more constantly, is attended by linear fissures, which penetrate to the quick in the lines of the palms, and by smaller cracks or fissures which extend less deeply.

20. (*e.*) *Centrifugal palmar psoriasis* is less common than the preceding. It begins in the palm by a single elevated spot, solid, and of small size, upon which a small white scale is formed. Around this elevation a series of red eccentric circles are produced, each in succession, and are covered by epidermic scales, which exfoliate. As these circles appear, each successive one is more eccentric, until the whole palm is implicated, and each undergoes desquamation. Squamous patches also appear on the palmar aspects of the fingers. The palmar integument is reddish, where the exfoliation of the scales has taken place, is thickened, and fissured by numerous chaps, some of which upon opening the hand, which is painful and stiff, sometimes exude a little blood.

21. Both these forms of palmar psoriasis are of long duration, they seldom continuing for a shorter time than several months, and often persisting for years. They often decline in summer and autumn, and are exacerbated in winter and spring, for a number of years. Palmar psoriasis is sometimes complicated with *psoriasis genitalium* in either sex. A modification of it sometimes affects, although much less frequently, the soles of the feet—*psoriasis plantaris*; but the severity of the symptoms is less in this situation, owing probably to the structure of the plantar integument, and to the protective coverings of the part. Fissures in this situation are much less apt to occur, and are smaller when they occur.

22. (*f.*) A variety of psoriasis diffusa occasionally affects the backs of the hands, and is called *grocers' itch*, because it is often seen in persons engaged in this trade; but it also often attacks bakers, laundresses, and others. It begins with two or three squamous elevations, which often spread until the whole back of the hand is covered. The integument at length presents numerous dry and painful fissures over or near the wrist and the articulations of the metacarpal bones and first phalanges of the fingers. This variety is distinguished from confluent and chronic *lichen* of this part by the circumstance of the latter always commencing in an eruption of small papulæ.

23. (*g.*) *Psoriasis of the nails* — *Psoriasis unguium*.—When the disease affects either the upper or the lower extremities, the nails often are attacked, even although neither the fingers nor the toes may be affected. But the affection of the nails never occurs without some other part being attacked. It is most frequently associated with psoriasis

guttata of the hands or arms. The nails, when diseased, become yellowish or tawny; thickened and irregular in their structure; rough, ragged, and brittle, and often bent over the ends of the fingers. A cheesy-like matter is sometimes formed at the roots of the nails, or between the roots and the matrix, as at the extremity of the papillary surface, these parts sometimes becoming unusually vascular, and giving rise to thickening, &c.

24. (*h.*) Psoriasis is often *complicated* with visceral disorder, as already noticed, and sometimes with *lepra* or *pityriasis*. It has also been seen associated, especially in children, with *eczema impetiginodes*, vesicles and purulent points appearing amidst the thin squamæ covering the patches of psoriasis. At a later period these patches become excoriated, and form thin, lamellar, yellowish scabs like those of eczema. This association is not infrequent in children during the period of teething, and occasionally at a more advanced period.

25. iv. PSORIASIS LEPRÆFORMIS.—SYNON.—*Lepra; Lepriasis.*—*Lepra Græcorum*, Auct.;—*Lepra vulgaris*, Willan;—*Psoriasis circinnatus;*—*Lepidosis lepriasis*, Good;—*Lepriasis annulata*, Dendy;—*Psoriasis orbicularis; Dartre Squammeuse arrondie*, Alibert;—*scaly leprosy; Greek leprosy.*—This chronic squamous eruption is *characterised* chiefly by its consisting of circular and slightly raised patches, which are speedily covered by thin, semi-transparent, epidermic scales; the patches being prominent at their edges, and somewhat depressed in their centres, and the scales being thrown off and replaced by successive formations. Lepra is occasionally confined to the knees and elbows, and it generally appears first in these situations, or rather immediately below them. In most cases it affects both legs or both arms at the same time. It is apt to extend by the successive formation of new scaly patches along the arms and thighs, to the breast and shoulders, and to the lumbar and lateral regions of the abdomen. The patches are sometimes more numerous, large, and prominent on the lower part of the trunk. The disease rarely extends to the hands or hairy scalp. The patches which appear on the head are usually of a small size. They are seen near the outer angles of the orbits, whence they spread along the eyebrows to the forehead and temples. When lepra extends to the hands or fingers, the nails and the matrices of the nails are often affected in a similar manner to that described above (§ 23.). Every where the patches are apt to coalesce by their corresponding edges; but the originally orbicular form of the aggregate patches is partially preserved in the arcs of circles which are seen in the circumference.

26. *A. Lepra vulgaris* commences with small, smooth, solid elevations of a dull red hue, around which numbers of other reddish, prominent spots, about a line in diameter, are evolved. The surface of the elevations become covered, in two or three days, with thin whitish scales. In four or five days the elevations spread, having thrown off the small spangle-like scale from their summits, and are attended by a sense of heat, tingling, or pruritus. They then enlarge rapidly by the extension of their circumference, which is raised and red; whilst the centres become depressed and paler than the margins. As the scales exfoliate others are produced, and are of a glistening or opalescent, or of a pearl-grey or pale yellow tint. The squamæ are not evenly spread over the surface of the patches, and they are detached partially and irregularly. After their fall, the skin which they covered looks red, shining, and somewhat raised. They are superposed, especially in the circumference of the patches, and thus become thicker and thicker, so as to form prominent layers. Even when small, the patches are never covered by a single scale. When they are recent, the corion does not present lines corresponding to those of the cuticle, but when they are older such lines are observed, and are often increased to wrinkles, which correspond with small indentations or ridges in the inner surfaces of the scales. However detached from the inflamed surface, a fresh formation of scales takes place.

27. The cure of the orbicular patches of lepra begins in the centres, and extends to the circumference. After the detachment of the squamæ the skin acquires, when they are not renewed, a greyish tint, with a shade of yellow. At a later period, the ring bounding the patches is narrowed progressively from within outwards; the circle at last is broken in one or more places, and the spot ultimately disappears entirely.—(RAYER.)

28. Lepra is seldom attended by any febrile disturbance, or other disorder than impaired digestion, assimilation, and excretion. The appetite is usually good, and generally greater than the powers of digestion. It occasions no further inconvenience than slight itching upon getting into bed, or upon changes of temperature. But when the patches are extensive or numerous, or when the inflammation of them is increased by a heating regimen, the patient feels so much burning or stinging pruritus, as often to disturb repose. When the patches surround the joints they cause stiffness, and occasionally are attended by small painful fissures. The disease is always of considerable duration; it often continues for years, sometimes for life. I am now attending a lady who has been afflicted with it extensively for upwards of forty years, although she has always had the advantage of the best medical advice.

29. *B.* The variety denominated *Lepra alphoides* by WILLAN is merely a milder form than the preceding, the squamous patches remaining of small size, and seldom exceeding a few lines in diameter. The spots increase slowly, are slightly prominent, and rarely run into one another. They form almost exclusively on the joints and extremities, and differ from the patches of lepra vulgaris chiefly in the small size and whiteness of the scales which are formed. They are commonly met with in children and delicate persons, and are not easily distinguished from psoriasis guttata. Several other modifications are sometimes observed in the form, disposition, and extension of the patches depending upon their seat and the constitution of the patient. But these are too numerous to describe. Some of them so closely resemble psoriasis as hardly to be distinguished from it. When this variety affects the scalp or pubic region it often occasions much pruritus or inconvenience; but it rarely affects these situations exclusively. The squamæ in these situations are generally yellow and furfuraceous, and are without the glistening micacious hue they present on the knees or elbows.

30. *C. Lepra nigricans* is a comparatively rare form of lepra, and is met with only in cachectic and broken down constitutions. The form and distribution of the patches are the same as de-

scribed; but the patches are not so large, and are generally without the central depression. Instead of being of dull red or rose-colour, they are of a livid or bluish brown hue. Mr. E. WILSON states, that the scales are so thin as to allow the lividity of the surface to be seen through them, are easily detached, and leave behind a tender and frequently an excoriated surface, from which a morbid serous fluid, often mixed with blood, is poured out. This exudation hardens into an irregular and friable crust. This variety is particularly annoying when it affects the scalp. It occurs chiefly in persons whose occupations expose them to the vicissitudes of the weather, and to a precarious diet, with fatigue and watching, and excesses in spirituous liquors, &c.

31. v. PSORIASIS ET LEPRIASIS SYPHILITICA. — SYNON. — *Squamæ Syphiliticæ.* — *Lepra Syphilitica, Psoriasis Syphilitica,* Willan; — *Syphilide pustuleuse,* Alibert; — *Syphilides Squameuses,* Rayer; — *Lepriasis Syphilitica,* Dendy; — *Scaly Syphilis.* — *Secondary syphilis* assumes every species and variety of cutaneous eruption; and no species more frequently than psoriasis and lepriasis in all their forms. Mr. DENDY states, that the most common form of scaly syphilis is that of irregularly scattered spots, which, however, become occasionally confluent, and sometimes three or four forms or distributions of scale is seen in the same subject, viz. *foliaceous laminæ* on the scalp, *guttated* and *diffused psoriasis* with indurated scales on parts subject to pressure, heat, or friction, as the palms, soles, axillæ, scrotum, and labia vulvæ; *psoriasis lepræformis,* or *lepra,* on the breast, abdomen, and thighs; and very rarely an extensive *psoriasis diffusa,* as a syphilitic eruption.

32. *A. Psoriasis guttata syphilitica* commences in a copper-coloured, livid, or violet spot; at first extremely small, usually becoming from six to eight lines in diameter, and when extending to the scalp, assuming a greenish olive, or dull yellowish hue. The spot is flatter, softer, and smoother than the incipient papulæ of common psoriasis, and less squamous, having little or no defined edge; or it may be sometimes larger or redder, more defined, and less squamous. The spots or patches are often more ovoid than circular; the diseased cuticle on their surface is usually more furfuraceous, still adhering tenaciously, and it is of a dull violet or yellowish hue, rather than white. When the scales are detached they are of dirty pearl grey, the livid colour being imparted by the subjacent tissue. After one or two exfoliations the squamous character often diminishes, and under mercurial influence, disappears in three or four months. If a syphilitic treatment fail, they will degenerate, the squamous character changing to that of a blotch, or even to superficial ulceration. In some cases, Mr. DENDY remarks, that in the centre of the scale a sort of pustular or ulcerated character is observable, even in an early stage, very similar to the moist crusts of *eczema.* This is never seen in the common forms of the non-syphilitic eruption.

33. *B.* Another form of scaly syphilis is that of a *dusky* or *brownish, livid, circular spot,* the centre slightly fissured and foliaceous, the cuticle detached as it were around the disc, and thus forming a white margin. This form nearly resembles ecthyma syphilitica. (See Art. ECTHYMA, § 6.) In both these forms of syphilitic scales, ulceration of the throat is often also observed.

34. *C. The annular syphilitic scale,* or syphilitic lepra, is less defined than the common circular lepriasis; the margins are slightly raised, the scales are dusky rather than white, and more annular. "In some cases the guttated and annular forms become one elevated, brownish, red mass, here and there spotted with scales."—(DENDY.)

35. *D.* Syphilitic scaly spots usually appear from five to ten weeks after the subsidence of a chancre. "Mr. CARMICHAEL believed it to be the sequence only of that ulcer which was marked by indurated edges—the true Hunterian chancre." Mr. DENDY does not think that it is thus limited, for he has seen it consequent upon primary pustules which had speedily subsided; and both consequent upon and coexistent with almost every primary form of the syphilitic malady.

36. The most common seat of scaly syphilis is on the forehead, "corona veneris," and the breast. When, however, the patches speedily arise during acute or often recurring primary disease, especially in depraved constitutions, often appear first in the vicinity of the organs of generation, and are then more defined. The character of the patches or spots is, however, much altered by the treatment, especially by external applications.

37. The spots of simple lepra are generally larger and rounder than those of syphilitic origin, the latter being much more rarely confluent and united into broad bands and patches than those of the former. Scaly syphilis is, however, much modified by locality. When it is seated in the axilla, or between the toes, it is moist, whitish, and very offensively fœtid. Sometimes also fissures form, and the cuticle peels rather than drops off. On the scalp, it assumes a greenish livid hue. On the palms and soles it is usually guttated. The spots, however, are not so distinct as in other parts, the cuticle, on being detached, also appearing more horny and yellowish; and in this situation exfoliation is often very protracted. If fissures form, and the feet and hands are subject to much pressure, they become deeply ulcerated. If the matrix of the nails become affected, painful or phagedenic onyxis may follow.—(DENDY.)

38. *E. Infantile scaly syphilis* is almost invariably marked by *snuffling* from the child's birth. The skin is of a dirty yellow or waxen hue, with numerous brownish pink spots, presenting a sprinkling of a grey or brownish white dust, which is often most abundant on the circumference of these spots. The disease may resemble also the livid spots already described, even at a very early age; but more frequently an association of these differently tinted spots are observed on the face and hands.

39. III. DIAGNOSIS.—The differences between the species of scaly eruption have often been exaggerated, or the extreme points of difference have been chiefly adduced and placed in bold relief by most of the writers on diseases of the skin, believing that the enumeration of minute distinctions, and the recognition of modifications of the external characters, would evince a more intimate knowledge of their nature than a display of their relations, not only with one another, but also with the state of the digestive, the assimilating, and the excreting functions, and of the circulating fluids. The devotion to "specialities," with the view of attracting the public by the presumed advantages of, and by the superior knowledge

assumed from, a division of labour, was first manifested in modern times by the writers on skin affections; and, like all others, devoted to a single craft, who adopt merely a minute segment of the great circle of medical science for their practices on the public, rather than for its proper cultivation and improvement, they merely partially advance the trivial and the mechanical to the detriment of profound or comprehensive views, and they fail in the recognition of extensive morbid relations. Whilst a few local distinctions, or mechanical contrivances are paraded as proofs of a superior acquaintance with the adopted subject, their narrowed powers of mental vision fail to recognise much more important relations and matters, the sources from which the local mischief proceeds, and the varied sympathies which either produce, or are produced by, the object of exclusive adoption and cultivation,—a cultivation resembling merely the superficial scraping of the soil by the hands of savage ignorance, not the deep ditching, the draining, and the manuring of applied science. The human microcosm cannot be advantageously studied in one of its parts only, nor can its states, affections, or structural lesions, be either understood or remedied by confining our inquiries and our means to a particular or limited locality, even although that locality is the seat of disease. The animal body is one and indivisible, no one part being independent of another, — no single system, or organ, or tissue, being disordered or diseased without implicating more or less the functions, and even the organization of several, or even of all the rest. Hence it is that no division of labour which has been adopted in medical practice in ancient times, since the ages of the PHARAOHS, down either to the modern days of the higher and more regular grades of empiricism, or to the lower degrees of quackery and imposture, has tended to advance medical science, or to raise the respectability of our profession. On the contrary, all such divisions,—all adoptions of a single member, organ, or viscus for special practice or study, have lowered in proportion to the degree of division, our science to a craft, and sunk the physician to an empirical practitioner, — they may have enriched the charlatan, but they have degraded the profession.

40. Those who have taken the eruptions of the skin under their protection, or the "Dermatologists," as they have dignified themselves, have generally laboured to point out the extreme distinctions which may exist between the several forms or cases of scaly eruption; limiting, however, their distinctions to the form, the size, the tint, and the thickness of a scale; and to the form, size, hue, and condition of the tissue underneath. Their distinctions have been always local, and without reference to the states of the assimilating and depurating functions, and of the circulating fluids and excretions. Even the most important of all local distinctions have been neglected; for they have failed to show whether the scales are an exuberant formation of cuticle,—are diseased cuticle hastily formed and as hastily thrown off,—or are merely a thin albuminous exudation on the inflamed surface, that becomes altered by the action of the oxygen of the air, and thrown off by the local morbid action and the state of its vital and vascular relations; or in how far various states or appearances of these scales depend upon a morbid cuticular formation, or upon a modified albuminous exudation — upon the production by and upon, the skin, of an oxidised albumen.

41. *The diagnosis of scaly eruptions* is therefore hardly to be regarded as respects the several forms which they assume, because shades of difference, too slight and too varied, and ever varying, to admit of description, are even more common than more marked distinctions; but it may be entertained as regards other eruptions with which the squamous may be confounded, upon a hasty or imperfect view, and if the history, progress, and morbid relations of the case are not observed. The chief differences which exist between the leprous and other species of psoriasis are, that generally in the former the patches are circular, with raised margins, and somewhat depressed centres, the scales being moderately thick and slightly adherent; whilst, in the other species the patches are irregular, not depressed in their centres, and are covered by thinner and more adherent scales. Psoriasis guttata, however, very nearly approaches to the leprous species, especially to the alphoid variety, the distinctions now stated existing in some respects, and the patches of the latter being generally of larger size. *Pityriasis* may be confounded with psoriasis,—indeed it is but slightly different, either in local characters, or in pathological relations from the several species of psoriasis; so that pityriasis, psoriasis, and lepra, may be justly viewed as species of one genus. The distinction between pityriasis and the other species consists chiefly in the more superficial affection of the skin in the former, and in the smaller size and more furfuraceous character of the scales. The integuments, moreover, are often chapped or fissured in the latter, and but rarely in the former. *Lichen circumscriptus*, with its annular clusters of papulæ, fading towards the centre, may sometimes be mistaken for leprous psoriasis, especially in process of cure; but the existence of the former is shown by the presence of marginal papulæ; whereas in the latter, the inflamed surface, denuded of its scales, is smooth and devoid of papulæ. *Tinea annularis*, or *ringworm*, at certain periods of its progress, either at the commencement or the end, when the crusts fall off and leave behind red annular-shaped patches, may be mistaken for lepra of the scalp, especially if there are patches on other parts of the body. But the one is as rarely seen on the body as the other is on the scalp; besides the favous pustules of the former will indicate its nature. It should be recollected that several varieties of squamous eruption may exist in the same case, and that it may be associated with other eruptions as with tinea.

42. IV. PROGNOSIS.—The several species of this eruption are more or less obstinate. The prognosis depend much upon the condition of the patient, and the duration, species, and state of the eruption. Even the mildest forms are apt to return after having disappeared, upon the recurrence of the causes, regimen, and diet especially, which first occasioned it. *Psoriasis guttata*, although not a severe form, is yet very obstinate, and is apt to return after disappearing. The *diffused variety* is still more obstinate, especially in debilitated, old, or cachectic persons; and the *inveterate form* often resists all treatment, particularly in those unfavourable circumstances. The same prognosis applies to the different forms of the *leprous species*. It is rarely attended by danger, and in young subjects it is often cured; but in adults and aged

persons it is always very rebellious, and often incurable, although treatment may restrain its progress, and palliate most of the more annoying symptoms. The existence of an hereditary predisposition to any of the species of scaly eruption, militates strongly against a perfect cure, especially in patients advanced in life; for, even if almost or altogether removed, it seldom fails to return. The *syphilitic scaly eruptions*, when not associated with serious disease of the throat, or of the periosteum, or of the joints or bones, and not advanced to extensive ulceration, will generally be removed by appropriate treatment, unless the disease be developed in the scrofulous diathesis, or is connected with an abuse of mercury, when a less favourable opinion of the result, as respects the constitution and vital organs, should be entertained.

43. V. THE PATHOLOGY OF SCALY ERUPTIONS has been imperfectly, if, indeed, at all considered. These eruptions have been viewed as altogether local, and their obvious dependence upon the state of the circulating fluids most unaccountably overlooked. Many years ago (in 1822) my attention was attracted to the state of the blood by a case of psoriasis, for which I had prescribed venesection, and found the serum remarkably milky or whitish coloured. Since then, other cases have furnished evidence of a superabundance of insufficiently assimilated chyle, of albumen, and sometimes of fatty matter in the blood of patients severely affected with either of these eruptions. It is very obvious that impaired function of the liver and digestive canal, as well as of other assimilating organs, will be followed by the presence, if not by the superabundance, of imperfectly assimilated chyle, and chyle-globules in the circulation; and that equally impaired excreting function will occasion a state of excrementitial plethora; the imperfectly assimilated and the effœte materials thus accumulated in the blood, exciting and perpetuating irritation of the capillary circulation of one or other of those emunctories whose office it is to remove these materials from the circulation. Irritation of the cutaneous surface having gone on to inflammation of a slow and chronic form, and the blood abounding with albumen, a state of capillary action and a material are thereby furnished for the formation of the scales which are so abundantly produced on the inflamed surface, and which is rarely, excepting at the commencement of the eruption, an altered state of the cuticle, and a morbid reproduction of it, but an exudation of albuminous lymph from the diseased capillaries, that is modified by the state of the blood and the local action, and by the oxygen of the air, so as to form the several varieties of squamæ observed in this genus of eruption. This view of the nature of squamous eruptions shows the impropriety of employing local or external means, solely or chiefly in the treatment, and of thereby shutting up a safety valve in the œconomy, opened by the course of functional disorders; and it accounts for the occasional supervention of serious visceral disease upon the suppression of the cutaneous eruption. It also suggests the use for these and similar eruptions of such means as shall most effectually remove the disorders of the digestive, of the assimilating, and of the excreting functions, upon which these eruptions are chiefly dependent, and the impropriety of prescribing external means otherwise than as aids to internal and constitutional treatment.

44. VI. TREATMENT. — The circumstances which require especial attention, before the intentions of cure are determined upon, in each case of scaly eruption, are the following: — 1st. The habit of body, diathesis, age, and employment of the patient. — 2d. The indications of disorder of the digestive, of the assimilative, and of the depurative functions, in connection with nervous and vital power. — 3d. The duration and character of the eruption, the causes in which it originated or tend to perpetuate it. These last circumstances should be viewed in connection with the previous diet, mode of living, &c. commonly adopted by the patient. These particulars being ascertained, the *states* of those suffering any form of the eruption may be arranged as follows, as furnishing the chief bases for therapeutical intentions: — *First, as regards habit of body*, &c., indications of *plethora*, or of *anæmia*, and of *digestive* and *excreting derangement*, ought to be carefully observed; and the several associations of these states: — *Second*, as respects the *duration* and *appearances of the eruption*, the amount and character of the *inflammation*, and the *discrete* or *confluent*, or *syphilitic* form of the eruption ought to be noted: — and *Third*, the state of *vascular action*, generally and locally, and of *constitutional power*. These data having been obtained as accurately as possible, and with due reference to the states of the blood and of the functions of waste and supply, the intentions are, 1st. To remove whatever disorder may exist in the quantity or quality of the blood, and in vascular action; 2d. To restore the digestive and depurative functions, as being subsidiary to the first indication; and 3d. To correct the morbid action on the skin by rational local means.

45. Viewing the cure of scaly eruptions as being thus dependent, at all times during treatment, upon a due exercise of the several vital actions, especially those of digestion and depuration, and upon a sufficient, but not an exuberant, supply of wholesome food, the application of these indications of cure should be accompanied with strict attention to *diet* and *regimen*, as noticed in the sequel, and with a careful avoidance of the several predisposing and exciting *causes* (§§ 3. *et seq.*).

46. *A.* If the patient be *plethoric*, *strong*, or *young*, and the eruption copious, red, and not of long duration, and more especially if the pulse present sufficient tone, local and general action not being impaired or asthenic, then *blood-letting*, according to the peculiarities of the case, should unhesitatingly be prescribed; and in healthy, dry, and country localities, if the patient has lived fully or richly, it may be repeated, according to the effect produced by the first. After bleeding, an active antimonial *emetic* ought to be given, and its operation freely promoted. When the stomach is quieted, the bowels, and through them, the liver should be freely evacuated, by chologogue and stomachic *purgatives*. At first, and on several occasions afterwards, a full dose of calomel, with some purgative, ought to be prescribed, and its free operation promoted by an *enema* containing spirits of turpentine and castor oil, or some other cathartic. These should be repeated according to circumstances, but sufficiently often to procure not only an entire evacuation of all crudities and accumulations, but also an increased discharge of all secretions and excretions from the digestive canal, and, through the medium of it, all effœte or injurious materials from the blood.

47. *B.* When the patient presents no indications of *vascular plethora*, or of increased action, and the patches are not very irritable, or much inflamed, then blood-letting may be omitted, or a small blood-letting only prescribed. In the metropolis and large manufacturing towns, vascular fulness and excitement are not generally such as require more than a small, or a local bleeding only; and not infrequently a state of anæmia, requiring opposite means to this, is met with in connection with scaly eruptions.—*a.* For the former of these cases *emetics* and *purgatives* are indispensable; and for the latter they are not the less so; but the purgatives should be either conjoined with *chalybeates* or vegetable *tonics*, or alternated with them, so as to improve the powers of digestion and assimilation simultaneously with the evacuation of injurious matters. M. CAZENAVE and SCHEDEL remark, that, "when the patient is young and vigorous, and the disease pursues a rapid course, the skin being hot and inflamed, and the pulse full and quick, then venesection, simple baths, diluents, strict regimen, and quiet, are necessary." To these, however, I would add emetics and purgatives as above advised (§ 46.). In old and feeble persons, or in constitutions broken down by privation or excesses, in whom there is either but little inflammation, or inflammation of an asthenic or cachectic character, a course of tonics should be directed, and either alternated with or followed by purgatives and other energetic measures, according to the peculiarities of the case.

48. M. BIETT, although he says nothing as to exhibition of an emetic, either at the commencement or in the course of treatment, strongly recommends a purgative course, especially when the disease is recent and the patient young or robust. He advises calomel every morning fasting in four-grain doses, either alone or with the same quantity of jalap. Sometimes sulphate of soda or sulphate of magnesia, taken in a considerable quantity of a bitter infusion, is very beneficial; and occasionally a more active purgative, as colocynth, scammony, gamboge, &c. may be employed. The choice should be guided by the conditions of the patient and of the eruption, and by the effects of the medicine previously employed. M. BIETT advises the calomel and the other purgatives to be continued daily for several weeks — for two months — if they do not produce a complete cure within that time. If salivation or other specific effects of the calomel appear, this substance may be omitted or the dose reduced; but this effect would seldom appear, and will not delay the cure. It is often necessary, or even advantageous, to suspend the treatment for three or four days, and then renew it. I have generally preferred to combine the calomel with rhubarb, and sometimes also with magnesia; or to give the calomel alone, much less frequently, and soon afterwards a full dose of sulphur and magnesia; or the pilula hydrarg., chloridi comp. with soap and extract of colchicum at bed time, and sulphur with magnesia in the morning. When sulphur is prescribed with magnesia an aromatic powder may be added, and the medicine continued, once or twice daily, so as to keep up a free evacuation from the bowels for several weeks, the tepid or vapour bath or other external means about to be stated being also employed in aid of them.

49. *b.* The *tincture of cantharides*, administered in any mucilaginous diluent in doses gradually increased from five to fifteen or twenty or thirty drops for a dose, was much praised by BIETT; and, as M. RAYER observes, occasionally causes the rapid disappearance of the eruption, especially of the leprous form when not severe, or only recent and limited in extent. But if taken in larger doses, it may, although it relieves or removes the eruption, excite inflammation of the digestive or urinary organs, or of both.

50. *c.* The *arsenical preparations*, especially FOWLER's solution, has proved very efficacious in scaly eruptions, and I have found it more certain in its effects than almost any other single medicine. But the good effects have seldom been permanent or even so progressive as to effect a cure, in the more severe cases, unless the diet be carefully regulated. There is often, also, a liability to a recurrence of the eruption after it has been removed by too large or too frequent doses of any arsenical preparation; but this liability exists in most cases, and is to be met only by a most careful avoidance of the exciting causes. MM. CAZENAVE and SCHEDEL state, that as psoriasis is often more obstinate than lepra, the remedies, especially arsenic, should be pushed further for the former affection; and that a permanent cure, without any dangerous results, may be obtained by the judicious administration of arsenical preparations. M. BIETT also entertains a similar opinion. These preparations should not be given oftener than twice daily, and the dose ought not to be larger than three drops at first, nor increased beyond ten or twelve. In many cases, they should be given after a full meal, especially when the dose is large, and when the course is protracted; and, unless the dose is very small, an intermission in the use of the medicine for three or four days should be directed. The following is the mode in which I have usually prescribed arsenic for the cure of psoriasis: —

No. 327. ℞. Liquoris Potassæ Arsenitis ♏ iij ad ♏ v; Liquoris Potassæ ♏ xv ad ♏ xxxv; Extr. Fluidi sarsæ comp. ʒj: Tinct. Aurantii ʒj. Infusi Gentianæ Comp. ℥x: Aq. Cinnamom. ℥ss. m. Fiat Haustus bis quotidie sumendus.

51. I believe that large or too frequent doses of arsenical medicines are not only more injurious to the constitution, but actually much less beneficial, as regards the eruption, than either very small or very moderate doses. This circumstance will account for the not very favourable opinion expressed by Dr. A. T. THOMSON respecting them. He observes, "That notwithstanding the powerful influence of arsenic in psoriasis inveterata, I have met with cases which resisted it, even when administered in the largest doses. In some cases erysipelas has accompanied the use of the arsenical solution, in which case the remedy should be suspended until the erysipelas be removed, and afterwards renewed in smaller doses."— (P. 67.)

52. *d.* Dr. THOMSON adds, "That the medicine on which the greatest confidence may be placed in psoriasis is the *liquor potassæ*." He commences with thirty drops in two fluid ounces of the bitter almond emulsion twice a-day, "and gradually increases the dose of the solution to eighty or even one hundred drops. If the patient be delicate, the infusion of yellow cinchona, or of cascarilla is substituted for the almond emulsion;" and he has found the hydrargyrum cum creta in

doses of six or eight grains, at bed-time, an useful aid to this practice. I have employed a similar treatment, but could rarely succeed in getting the patient to take so large doses of the solution as he advises: indeed I view them as injurious to the digestive organs and kidneys. I have seen marked advantage derived from it conjoined with the *iodide of potassium*, and taken either in a bitter infusion, or in one of the decoctions advised for this eruption.

53. *e*. The *bi-chloride of mercury*, taken in the decoction of cinchona, or of sarsaparilla, or of dulcamara, has been also recommended, and is beneficial in slight or recent cases; but has failed in every case of inveterate or of protracted leprous psoriasis in which I have tried it. Dr. A. T. THOMSON states, that he has found the combination of iodine with mercury the most successful of any mercurial preparation for this disease. "The *biniodide*, in doses of a sixth to a fourth of a grain exerts almost a specific influence upon the morbid state of the skin; and when given at the same time as the *iodide of arsenic*, and aided by blood-letting, it has rarely failed in curing the most inveterate cases." As the acrimony of the preparation has disturbed the alimentary canal, he has usually combined it either with opium or with conium, carefully avoiding ptyalism. As, however, he has usually combined the *biniodide of mercury* with the *iodide of arsenic*, it is difficult to determine what share each may have had in the cure. He prefers this preparation of arsenic to the liquor arsenicalis. The dose of it, at first, ought not to exceed one-tenth of a grain; and in no instance should it be carried beyond one-third of a grain. "Its obvious effects are quickness and hardness of pulse, with slight puffiness of the lower eyelids; but generally, before these symptoms display themselves, the disease has begun to yield. The symptoms which indicate a necessity for reducing the dose are, heat of the mouth and fauces, anxiety at the præcordia, pain at the epigastrium, or griping. If, besides these, there is tension, with stiffness around the eyes, erythema of the face, thirst, white tongue, the edges and tip of a florid red hue, and a quick pulse, the medicine should be suspended for some days. If nausea, cough, vertigo, or salivation supervene, it should be left off altogether. The employment of any arsenical preparation is inadmissible, if it cause an uneasy sensation in the chest from the first."

54. The reason of the failure of arsenic in the cure of leprous and inveterate psoriasis is, in many cases, the large, or too frequent doses in which it has been prescribed; the poisonous effects of the arsenic being thereby produced before sufficient time is afforded for the development of the alterative operation of the mineral. Most writers who have depended chiefly on arsenic for the cure of scaly eruptions, have advised small or moderate doses, and a protracted course of it. GIRDLESTONE, BIETT, RAYER, WILLAN, BATEMAN and ERICHSEN advise from two to three drops, twice a day, up to seven or eight, this dose not to be exceeded, and the course to be persevered in, if none of the injurious symptoms just noticed be occasioned by it.

55 *f*. Recently, a preparation of arsenic, iodine and mercury has been strongly recommended for the more obstinate and inveterate cutaneous eruptions, by Mr. DONOVAN, under the name of the "*Liquor Arsenici et Hydrargyri Iodidi*." The composition of this solution is as follows:—Water, one drachm; arsenious acid, one eighth of a grain; peroxide of mercury, one fourth of a grain; iodine, as hydriodic acid, about three fourths of a grain. Twenty minims three times a day have been considered as a proper dose with which to commence a course of it, and forty minims, thrice daily as the largest dose. I have prescribed this solution in many cases; but I consider the dose here advised as very much too large. If the tongue be at all foul or loaded, an emetic, followed by two or three doses of calomel and rhubarb, or jalap, ought to precede a course of it; and at first, from five to ten minims, twice or thrice daily, and very gradually increased to twenty or thirty, at the utmost, will be sufficient. This solution is most serviceable when the liver is torpid or loaded, and in the strumous diathesis. It, as well as the biniodide of mercury, is very efficacious in the syphilitic scaly eruptions. Mr. DENDY recommends the occasional use of the warm nitro-muriatic foot-bath during the course of this solution.

56. As to the use of arsenical preparations in psoriasis and lepra, Mr. ERICHSEN very justly observes, that they should not be given until the disease had assumed a chronic or inactive character. As long as there is inflammatory redness, heat, or irritation of the patches, they ought not to be employd, as the irritation of the arsenic will augment these symptoms. Besides, during the earlier periods of the eruption, a cure may be effected by the antiphlogistic and other means I have above advised, especially by depletions, emetics, and purgatives, with strict attention to diet and regimen. It is only, therefore, in very indolent, or extensive squamous diseases, and after other remedies have failed, that any of the arsenical preparations should be prescribed; and in all circumstances, they ought to be given cautiously, and their effects closely observed; for, if prescribed too largely, or too long, they may injure the constitution much more than the continuance of the eruption, which, in many circumstances, admits of palliation merely, and not of complete cure.

57. *g*. There are various other medicines that have been prescribed, internally, for the scaly eruptions. The chief of these are, the decoctions of *dulcamara*, of *guiacum*, of *mezereon*, of *elm-bark*, the infusions of *nettles*, of *marsh rosemary*, the decoctions of *sarsaparilla*, *sulphur*, and the *sulphurets*, or the milk of sulphur conjoined with magnesia, or with either of the alkaline carbonates, and the æthiop's mineral and other preparations of *antimony*. Either of these infusions or decoctions may be made the vehicles for the administration of other more active agents, as the liquor potassæ, with or without the iodide of potassium, the liquor iodidi arsenici et hydrargyri, the liquor hydrarg. bichloridi, &c. In some obstinate cases of psoriasis, after morbid secretions and excretions have been evacuated, I have lately resorted to the use of *spirit of turpentine* internally and externally, prescribing this substance either alone or with oleum ricini, in doses of half a drachm, or of one drachm, twice or thrice daily, and after two or three days, the occasional application of an epithem, or embrocation of this spirit over the part chiefly affected. The turpentine ought to be discontinued as soon as it irritates the kidneys, but persisted in, if it acts gently on the bowels. It

will be taken with little inconvenience on the surface of a little milk or coffee. I have occasionally prescribed *tar-water*, internally as well as externally. It will be found a medicine of considerable power in this and other cachectic disorders, if appropriately employed. *Pitch, tar*, and the *turpentines* have been recommended internally and externally for squamous diseases, and generally in the form of pill, when administered internally, tar and the turpentines being rendered more or less consistent by means of magnesia. They are sometimes of service; but they often, in this form, pass into the large bowels undissolved, become excrementitial, and hence have little effect.

58. *C.* The *state of the constitution* as well as of *general and local action*, should guide the physician in the choice of remedies, which ought to be chiefly *antiphlogistic* and *evacuant*, in the acute or early stage, and *alterative* and *depurative* in the chronic or advanced states. In many cases, however, alteratives and depurative remedies require to be combined with tonics and even with chalybeates; especially in *cachectic habits*, and when the eruption assumes a livid or dusky hue. In these, the iodide of potassium with the carbonate or solution of potass and sarsaparilla, or tonic infusions, or the iodide of iron with syrup of sarsaparilla, or the bichloride of mercury in the tincture or decoction of bark, with tincture of serpentaria, or the fluid extract of sarsaparilla, will generally be of great service; and, if a cure be not effected by these, aided by external means (§§ 61. *et seq.*), then the preparations of arsenic, or the combinations of arsenic, iodine, and mercury, may be resorted to, as above recommended.

59. *D.* The *syphilitic varieties of squamous eruption* should be treated with strict reference to the history of the case, and the means which have already been employed and the period of their employment. Several severe cases of this eruption, some of which had either gone on to extensive ulcerations or become complicated with disease of the throat, or the bones or joints, have at sundry times come under my care. For these, there are certain remedies, which, if judiciously employed, may be viewed as specifics.—*a.* The oldest and not the least efficacious of these, is the *bi-chloride of mercury*, prescribed either in the manner recommended by VAN SWEITEN, or given dissolved in alcohol, and taken in water with the hydrochlorate of ammonia, or in decoctions of sarsa, &c., or prescribed with the decoctions or infusions, or tinctures of cinchona, serpentaria, &c. When the eruption and its antecedent symptoms have not been attacked by a mercurial course, then the bi-chloride should be given in decided doses, and preferably soon after a full meal, either in the form of a pill and in gradually increased doses, as advised by VAN SWEITEN, or as just recommended, in either of which combinations it may be taken in the intervals between meals. Salivation, unless it be slight, need not be produced; although the specific effects should be continued for some time; when either of the other remedies next to be noticed should be prescribed, if the eruptions have not nearly or altogether disappeared.

60. *b.* The next specific remedy for this species of eruption is *iodine*. I believe that this substance, or any of its preparations, had not been prescribed for any form of syphilitic disease, when first I ordered it in the summer of 1825, the formulæ, as well as an ioduret of sulphur, having been prepared by Mr. MORSON, the eminent operative chemist. At first I employed the iodine either in the form of a weak tincture, or in combination with potash, or the iodide of potash with the addition of pure iodine. Subsequently I preferred the iodide of potash, conjoined with liquor potassæ and sarsaparilla; full doses of PLUMMER's pill being taken at bed-time. The iodides of mercury have more recently been employed for this eruption, and are generally beneficial; but they are not superior to the treatment which preceded them. They are, however, advantageously given in the form of pills, at night or night and morning, the iodide of potass being taken during the day, with liquor potassæ and sarsa. In the syphilitic species, also, Mr. DONOVAN's solution is an excellent remedy, and may be advantageously adopted in the more protracted cases.

61. *E. The internal and external use of mineral waters, either natural or artificial, and of simple or medicated baths*, will generally promote a cure. It is preferable, however, not to have recourse to these until morbidly increased action and vascular or excrementitial plethora is removed by depletions, emetics, purgatives, antimonials, &c. But this end being attained, the sulphur waters of Harrowgate, Leamington, Moffat, Crofton, and of other springs in this country; or of those of Barèges, Cauterets, Bagnères, Bagnoles, &c., on the Continent, will be employed with great advantage. A frequent use of warm baths, the patient remaining in them for a considerable time, and using gentle friction over the affected parts, will often be of service. A small quantity of the sulphuret of potash may be added to the bath. If the eruption be attended by much itching, the biborate of soda dissolved in the water will prove very beneficial. Dr. DUFFIN recommends the immersion of the part, especially when the extremities are chiefly affected, in warm artificial Harrowgate water; or the diseased parts to be washed or fomented with it twice or thrice daily, for fifteen or twenty minutes each time; and a mixture of equal parts of the weak citrine and tar ointments to be applied after each fomentation. The following formula is given by him for the preparation of this water: — Sulph. magnesiæ ℥ij; supertart. potassæ gr. x; sulphat. potassæ cum sulphure (or sal polychrest) ʒ ss. These are directed to be dissolved in twenty-four ounces of warm water, and used for a wash or fomentation. I have lately employed a wash or fomentation, either warm or tepid, with tar-water, containing biborate of soda dissolved in it.

62. If the scales adhere, or are accumulated in crusts, sulphureous vapour baths, followed by frictions, or gently stimulating ablutions, or fomentations, with a solution of the biborate of soda, or with a little liquor potassæ, will be of service. The application of steam or vapour, with or without the fumes of sulphur, is always of use. Lotions of diluted alcohol, of solutions of sulphuret of potass, or the decoction of dulcamara, will aid the exfoliation. When the scales are removed, BATEMAN and THOMSON recommend the unguentum picis, or the unguentum hydrargyri nitratis, diluted with the ceratum plumbi compositum, or with simple ointment; or, which is better than either, an ointment composed of

equal parts of these two ointments. The ointments which I have preferred are the *induret of sulphur ointment* (gr. xij. or xj to ℥j), the *calomel ointment* (ʒj to ℥j), the *ointment of white precipitate*, the *zinc and lead ointments conjoined*, and the several *ointments of the nitrates of mercury* and of the *iodide of mercury*. These last should, however, be employed more or less diluted. The ointments containing either of the iodides are most suited to very obstinate cases, the others for slight or recent cases. The iodide of sulphur ointment was first employed by the author in 1825. The ointments should be applied at night and washed off in the morning with a saponaceous or alkaline lotion (as ʒiij of liquor potassæ in ℥vij ss. of water), after which a solution of the bi-chloride of mercury, in dilute alcohol (gr. ij in ℥i p.), may be applied slightly by a sponge over the part. Besides these ointments, others, with the acetate or phosphate of mercury, with the sulphate and deutoxide of antimony, with an ioduret of ammonia (ʒj to ℥j), with camphor, or with concrete naphthaline (two to four parts to thirty parts of lard), have severally been recommended by different writers. A principal advantage derived from ointments is the protection of the inflamed surface from the action of the air, to which very insufficient attention has been directed in the treatment of cutaneous inflammations. Therefore, after the surface has been cleaned by any of these ointments, they should be washed off, and some gelatinous, albuminous or gummy preparation applied to it, so as to exclude the air, as advised for PITYRIASIS (§ 27.); and this preparation should be allowed to remain as long as it answers this purpose, when it should be removed by fomentations and ablution, and reapplied until the parts are completely restored. I have lately employed for scaly eruptions, a lotion of one part of *Glycerine*, to three, four, or five parts of water, with marked benefit; and Dr. GLOVER has recommended *Iódoform* externally (ʒss. — ʒi. to the ℥j. of cerate), and internally, in doses of two or three grains twice or thrice daily.

63. As I have shown in the article PITYRIASIS, the chief causes of the obstinacy of scaly and other cutaneous eruptions, are — 1st, The action of the air, from which they are not sufficiently protected during the treatment; — 2nd, The want of due attention to the state of the assimilative and depurative functions of the blood; — and, 3rd, insufficient restrictions on diet and regimen. But, even when a cure is obtained, or nearly obtained, a *relapse* or a *return of the eruption* is a frequent occurrence—a relapse generally proceeding either from the causes just specified, or from a premature relinquishment of treatment; a subsequent return of the disease resulting from the same causes as produced it at first, or from inattention to the several digestive and excreting functions. Both these unfavourable contingencies are most likely to occur when the functions of the several abdominal organs have not received due attention during the treatment, and a restoration of them to the healthy state has not been effected; and also when the healthy conditions and colour of the parts affected have not been completely restored before the successful means were relinquished. These two causes, especially when acting simultaneously, with errors in diet and regimen, are most influential in producing relapses, and returns, at more or less remote periods, of scaly eruptions; and they are of greater importance than they have hitherto been considered.

64. *The local forms of psoriasis and lepra* mentioned above (§ 16, *et seq.*), require chiefly the adaptation of the general and local treatment already described to the circumstances of each case. — (*a.*) *Psoriasis palpebrarum* will often be benefited by the application of three or five leeches behind the ears, and by a lotion consisting of a weak solution of the nitrate of silver, or a lotion of sulphate of zinc, or diluted tincture of iodine, to the part. The calomel ointment, or the zinc ointment, or a diluted nitrate of mercury ointment, may be severally applied in this and the other local forms of the eruption. — (*b.*) For *psoriasis genitalium*, emollient local baths, and the use of the lotions and ointments just mentioned are most beneficial. If these forms be attended, as they usually are, with much itching or irritation, a solution of the bi-borate of soda in tar water, or in some emollient fluid, containing creasote, applied as a lotion, or by a sponge, will generally give relief, and remove the eruption. Sulphur and cinnabar fumigations are usually successful when the scrotum or anus is implicated. — (*c.*) For *psoriasis palmaria*, after soothing the parts with local baths of the decoction of bran, &c. ointments containing the iodide of sulphur, or the iodide of mercury, or the other ointments already mentioned, may be employed in aid of the constitutional remedies recommended. In the more chronic states of psoriasis palmaris, Mr. WILSON advises a spirituous lotion of bi-chloride of mercury, followed by water dressing.

65. The *mineral acids* have been favourably mentioned by some writers; but I have seldom observed much benefit derived from them; and have even believed them to have been sometimes injurious. In a few cases, however, after a due evacuation of accumulated secretions and excretions, the liver still continuing torpid, the nitro-muriatic acids given internally and employed externally have appeared of some use; and the sulphuric acid has occasionally been added, with marked advantage, to the neutral sulphates, dissolved in bitter infusions, and taken in quantities sufficient to keep the bowels freely open. Dr. C. SMITH and Dr. CUMIN, however, are of opinion that dilute sulphuric acid possesses considerable efficacy in the treatment of squamous eruptions; the latter physician believing that the acid is decomposed, and that the system is thereby impregnated with sulphur. This may be the case when the quantity taken is small or very moderate: but in some experiments I found that the dilute acid, when given in large and frequent doses, could be detected unchanged in the urine. Acids, however, ought to be employed with caution, and with strict reference to the excretions, especially the urine, and its saline constituents.

66. The *diet and regimen* are of the greatest importance in the treatment of all the scaly eruptions, and are often more beneficial, if strictly enforced, than even medical means. Animal food should be used sparingly; and pork, veal, ham, dried or smoked and preserved meats; fish and shell-fish, especially fried and rich fish; rich sauces, doughy articles, pastry, or pie-crust; pickles and preserves; heating and stimulating

beverages, especially spirituous and malt liquors, coffee, punch, acid wines, &c. ought to be constantly avoided; and sugar, butter, and sweet or acidulated articles very sparingly taken. The remarks offered on this topic, in the article Pityriasis (§ 34.), a species of the eruptions now treated of, strictly apply to the treatment of these eruptions.

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PUERPERAL STATES AND DISEASES.

— The Pathology of Parturition. — Diseases incidental to the Puerperal States. Classif. — General Pathology. Special Pathology.

1. Several of the diseases incidental to parturition and to convalescence from this act are discussed under their special denominations; and to these I shall refer as they successively take their places in the group of maladies usually called "*Puerperal*." In this place, therefore, it chiefly remains to discuss,—1st. *The pathological relations of the puerperal state*; and 2d. *The very dangerous and often malignant maladies incidental to it, which are not treated of under other heads.* That a view of the pathological relations of the puerperal state, impartially exhibited, and without reference to peculiar doctrines, will be of use, it is hoped, in guiding the inexperienced during their intercourse with the deviations from the more common procession of morbid phenomena which will occasionally be met with by them, is only a reasonable expectation; and hence an inducement to undertake the labour which a faithful exhibition of this view involves.

2. I. The Pathology of the Puerperal States. — i. Of the State of the Female at the most advanced or full Period of Pregnancy. — The changes, as well as the principal deviations from the healthy state, during utero-gestation, are described in the article Pregnancy, and under various other heads. It only remains to notice the state presented by the female œconomy, when gestation is approaching, or has reached its full period. The uterus then has attained its utmost size; and it then enjoys a copious determination of blood for the nourishment and growth of the fœtus, and for the preservation of its own augmented structure. The distended uterus, especially in a first pregnancy, presses more or less, according to the size of the female, and the capacity of the abdomen, upon the other viscera, especially on the urinary bladder, the kidneys, the rectum, and large bowels, the liver and biliary apparatus, and stomach; and consequently the descent of the diaphragm is impeded, and congestion of the lungs is favoured. But the pressure also influences the circulation through the large venous trunks, and often, in some degree, through the heart and lungs; hence arise congestion of remote parts, especially of the veins of the lower extremities, often followed by œdema, and congestion of the sinuses within the cranium, with the dangerous consequences of this condition. The effects produced by the large size of the uterus are very much aggravated if pressure upon the lower bowels be allowed to interrupt the regular process of fæcation and excretion; and if this cause or indigestion should give rise to flatulent collections in any portion of the alimentary canal.

3. With the increased development of the pregnant uterus, the peritoneal envelope of the organ, and even the ligaments experience a remarkable change, and are inordinately stretched, so as to favour the supervention of inflammation, especially upon the removal of the distending cause, when additional influences come into operation. With the ascent of the fundus of the uterus, the omentum is more or less displaced, and carried upwards; its exact position and influence upon adjoining parts varying with the quantity of adipose substance it may contain.

4. It is obvious that changes of the position and condition of the viscera must influence more or less the functions performed by these viscera; and that, both during the progress of these changes and at their consummation, various disorders, noticed under Pregnancy, are liable to appear—that the secretion and excretion of urine should be disturbed or impeded, or even arrested, the functions of digestion and assimilation disordered, the intestinal secretions and excretions interrupted, and sensibility and motion materially disturbed. At the full period of gestation, the circulating and respiratory organs, and still more the nervous centres, owing to the congestions to which they are exposed at this period, are severally liable to the most serious attacks as soon as the congestion, in which these attacks originate, is carried to the pitch requisite for their development.

5. In connection generally with the changes now mentioned, if not always dependent upon these changes, the nervous system generally acquires increased sensibility and susceptibility of impression; and, through the medium of this system more directly, and through that of the vascular system more indirectly, the whole frame intimately sympathizes with the uterus, independently of the mechanical effects produced by it upon the other viscera. The nervous development of this organ, and the vascular determination to it, influenced by the nervous organization, renders the womb the centre of numerous sympathies, and the source of many morbid phenomena, all which increase and become more prominent with the progress of pregnancy, and still more manifest at the full period, during parturition, and for some time after delivery. The activity of the nervous influence, and of the vascular circulation of the uterus at an advanced stage of pregnancy, influences remarkably the conditions of both the nervous and the vascular system generally, notwithstanding the various pathological conditions tending to impair the energy and sensibility of the one, and the tone and action of the other — notwithstanding interrupted excretion, and the various circumstances favouring excrementitial contamination of the blood, and congestion of it in venous trunks and sinuses.

6. ii. OF THE CHANGES TAKING PLACE DURING THE PARTURIENT PROCESS, AND THEIR INFLUENCES IN CAUSING DISEASE. — The uterus, having completed its function of fœtal development, or having carried this function as far as is consistent with the health and subsequent safety of the mother, experiences that state of action which is the best calculated to preserve both the child and the parent from injury and disease. But during this action, and the changes in the nervous and vascular systems which it more or less remarkably produces, various morbid conditions are apt to appear. The painful contractions of the uterus, although occurring only at intervals, tend to excite or react upon the nervous systems generally, but more remarkably upon the spinal cord, and through it upon the brain. These contractions also tend to diminish the flux of blood to the uterus, and to determine it in greater quantity to the brain, and thereby to change a pre-existent state of passive congestion into active and increased congestion, or to carry a condition of the vascular system, which was insufficient to produce acute disease, to that pitch which instantly developes such disease.

7. The uterine actions, although often thus productive of seizures depending upon the states of the cerebro-spinal nervous centres, especially as regards the circulation of these centres and the peculiarities of that circulation, are yet independent of these states. This fact is undeniably demonstrated by the occurrence of uterine action independently of the will, and during abolition of the functions of the cerebro-spinal system; by natural parturition taking place during paraplegia as well as hemiplegia; and as shown recently by the regular progress of the parturient process, whilst sensibility and voluntary motion are abolished by the inhalation of æther or of chloroform. It is obvious that the muscular contractions, and the painful excitement of the uterine nerves during parturition, will occasionally develope morbid tendencies in the nervous system when these already exist, owing either to hereditary or to acquired predisposition, and consequently that convulsive or apoplectic seizures, or phrenitic or maniacal attacks will occasionally appear during this process; the convulsive seizure presenting more or less of the apoplectic, of the epileptic, or of the simply convulsive character, according to the predisposition and peculiar circumstances of the case; the maniacal attacks rarely appearing during parturition, although frequently after this process. Convulsive seizures are not confined to parturition, for they occasionally take place previously to, as well as after, this process; but during it, they are more apt to assume an apoplectic or epileptic, or a mixed form — in consequence of the greater liability to active congestion of the brain and spinal cord during the parturient act — the apoplectic being characterised by profound coma and stertorous breathing, with slight convulsions, the epileptic by the violence of the convulsions, by frothing at the mouth and injury to the tongue. (See Articles CONVULSIONS, PUERPERAL; and INSANITY, PUERPERAL.)

8. Certain changes in the uterus itself may take place during pregnancy, or even may have existed previously, and may arrive at a dangerous or even fatal termination upon the accession or in the course of parturition. Thus inflammation may have attacked a portion of the pregnant uterus and occasioned softening, or impaired action and tone, or even a greater lacerability of that portion, in consequence of either of which changes rupture of the uterus, or dangerous hæmorrhage may take place during parturition; or, if either of these do not supervene, inflammation of the uterus, or of its veins or sinuses, or peritonitis, or puerperal fever, may follow delivery; the previously diseased state, and the exhausted tone and contractile power of the organ especially favouring the occurrence of these maladies.

9. There are various circumstances connected with parturition productive of disease either of the uterus or of adjoining and associated parts. The interferences arising out of impatience and want of confidence in the efforts of nature — a premature or inconsiderate, or a too long delayed, recourse to medicinal or mechanical aids of parturition, and the injury which these may occasion either to the uterus, or to parts in the vicinity, or even to both, are amongst the most influential causes of disease, not only of the parts thereby injured, but of the frame generally through the media of the nervous and vascular systems. The means which have recently been recommended for the prevention of pain during parturition, although quite competent to the production of this result, cannot be viewed as altogether innocuous. Several instances have already occurred, evincing not merely dangerous but actually fatal effects from recourse to them. A fatal issue may certainly be prevented from taking place immediately from these means; but the changes which may terminate fatally cannot be so readily prevented in all cases, and at the same time accomplish the intention for which they are employed. These anæsthetic agents have been demonstratively shown not only to destroy sensibility for a time, when inhaled for a short period, but also, in comparatively short periods of inhalation, to produce congestion of the lungs, a manifest change in the state of the blood, and even a

rapidly fatal result. That these agents, when adroitly and cautiously administered, may not occasion any inconvenience subsequently to their inhalation may be the case, in nine out of ten instances in which they have been employed will be readily admitted, but the tenth instance may be one of serious puerperal disease, of convulsions, or of mania, or of fever, or of congestive pneumonia, or bronchitis, owing to the previous state and predisposition of the patient—events which cannot be anticipated or guarded against by the physician. Pain is often salutary as respects its effects, and especially in enabling the œconomy to resist, and to rally against, the depressing operation of shocks upon the vital influence; and, when neither its violence nor its continuance is productive of injury to the constitution, or of exhaustion of vital power, to endure it is preferable to the annihilating of sensibility by an agent which acts so remarkably, and so immediately, upon the chief manifestation of animal life, arrests the usual processes of nature, and even terminates existence itself if employed a few seconds longer than is required to destroy this the highest function of living creatures.

10. iii. Of the State of the Female after Parturition, and its Influence in favouring the Occurrence of Disease.—In estimating the state of the female upon delivery the previous conditions now passed in review—those just antecedent to parturition, and the act of parturition itself, ought to be held in recollection. The pressure produced by the gravid uterus upon adjoining viscera, and the effects of that pressure as shown above (§§ 6. *et seq.*), are now suddenly removed. The vitality of the frame has sustained some degree of shock from the violent contractions of the uterus, the expulsion of the fœtus, and the detachment of the placenta, as well as from the sudden loss of blood, and the removal of pressure and distension. The internal surface of the uterus, moreover, resembles that of an extensive wound, especially where the placenta was attached to it; whilst the peritoneal surface of the organ, and the positions and physical conditions of the several abdominal viscera, are now more or less changed. The general results of these concurrent changes are not severely felt by robust or sound constitutions, beyond what may be viewed as a slight shock to the vital energy, attended by more or less exhaustion consequent upon the pains, the uterine action, and the loss of blood; but this result in these constitutions amounts not to disease; it is merely a state of vital exhaustion, which nature soon repairs; but which readily favours the development of disease whenever any of the causes to which puerperal females are often exposed comes into operation. It is different, however, with females who are otherwise circumstanced, especially with the delicate, the insufficiently nourished, and the morally depressed. If there exist a deficiency or poorness of blood; if fæcal accumulations have formed in the large bowels; if the patient be nervous, hysterical, or subject to sudden or epileptic seizures; if she entertain fears of her state, or anxieties as to the present or future; and if she be exposed to the impure air of a low, miasmatous, damp and close chamber or locality; or to the contaminating and infectious air of an hospital; or to any of the numerous causes which induce the diseases incidental to child-bed, then the effects, whatever may be the especial form which they assume, will be most serious and often fatal.

11. In proportion to the severity of shock produced by the parturient act upon the vital energy, and to the susceptibility of the nervous influence and sensibility of the patient, will the liability to the supervention of puerperal maladies be great. Mania, watchfulness, headach, convulsions, imperfect contractions of the uterus, or an impeded return of the organ to the size proper to the time which has elapsed since delivery; suppression of or irregularities in the lochial discharge; suppression of the secretion of milk, &c. may severally follow severity of shock, especially when heightened by marked susceptibility and sensibility; and these latter will, in their turn, be greatly aggravated by large losses of blood relatively to the condition of the vascular system, even although no other malady be superinduced. After considerable hæmorrhage, also, particularly when vital exhaustion is remarkable, or when the mind is anxious or depressed, morbid emanations strongly impress the nervous system, and readily pass, by endosmose, into the pulmonary circulation. The contractions of the uterus being then also inefficiently produced, the lochial discharge is partially retained and rapidly altered; and, thus altered, it is partially imbibed by the vessels opening on the internal surface of the uterus, inflaming these vessels and venous sinuses. But the matters retained in the uterus may not merely inflame these vessels, they may also contaminate the organ itself; and being imbibed and absorbed into the circulation, contaminate also the whole mass of blood, with or without manifest change in the uterine vessels and structure; and, moreover, after such contamination, superinduce remarkable constitutional effects and structural lesions of those parts especially which have undergone the more evident alterations as to position and condition during the successive stages of gestation and parturition.

12. Thus, after parturition the female frame is particularly open and liable to be invaded by the most influential causes of disease;—1st, By mental excitement and impulse, and by moral depression;—2nd, By the inhalation of morbid effluvia, proceeding either from other diseases, or from the decomposition of animal discharges and secretions, or from the other sources generally productive of infectious emanations;—3rd, By the absorption from the cavity of the uterus itself retained and partially decomposed discharges;—4th, By infectious matters retained in the foul bed-clothes, mattresses, or beds in which the female is confined;—5th, By the retention and absorption of altered secretions and excretions, or of fæcal matters from the alimentary canal;—and, 6th, By interrupted secretion and excretion, the blood being altered more or less, owing to the accumulation in it of morbid or excrementitial materials.

13. iv. Of Convalescence after Parturition.—*A.* The natural Course of Convalescence.—*a.* The *shock* consequent upon delivery soon subsides when it is moderate and the patient obtains a few hours' sleep, if all disturbance or excitement be prevented. In proportion to the subsidence of this effect upon the vital power, the comfort and repose of the patient return, and nervous symptoms or vascular excitement are presented. As the shock subsides, and exhaustion is diminished, so are the several secretions

and excretions, with the new secretion of milk, re-established. The *circulation*, as indicated by the pulse, which was excited or increased in frequency during the progress of labour, falls below the natural standard immediately after, and continues below it during a few hours. After varying somewhat for the following fourteen or fifteen hours, the circulation becomes slightly increased on the secretion of milk; and, when this secretion is established, it generally continues about the natural state.

14. *b.* The *uterus* contracts more or less firmly immediately after delivery, so as to reduce it, in the more energetic cases of contraction, to about the size of the infant's head. This contraction — 1st, Prevents hæmorrhage; — 2nd, Empties the cavity of the uterus, and prevents the lodgment of coagula; — 3rd, It constricts the uterine vessels and sinuses, evacuates their contents, and prevents their tendency to imbibe fluids, which may be retained in the cavity of the womb; — and, 4th, It diminishes the afflux of blood to the uterus. The contraction and diminishing size of the womb proceed, although not regularly, or without recurrences of slight relaxation, until about the eighth, or ninth, or tenth day, when it descends into the pelvis. Previous to the eighth day, its state may be ascertained through the relaxed abdominal parietes; but afterwards the fundus only can be felt above the pubis, and in six or seven days it can no longer be detected. This diminution of bulk is not altogether attributable to contraction, but to absorption in part, and in no small degree to the exclusion of the supply of blood, and to the pressure, by the contraction of the uterine fibres, of the fluids from the vessels and the interstices of the structure. It may, however, be doubted whether absorption is concerned in lessening the size of the womb after delivery, the lochial discharge probably contributing to this result.

15. *c.* The condition of the *internal surface of the uterus*, after delivery, is a matter of interest. "For several days after parturition, when no disease of the uterus has supervened, its lining membrane is coated with a yellowish brown, dark red, or ash-grey coloured layer of no great thickness, which seems to be formed chiefly of the fibrine of the blood, with small portions of deciduous membrane." The part to which the *placenta* was attached is raised above the surrounding level: its surface is unequal, resembling in this respect a granulating ulcer; its size is wonderfully reduced. In this situation dark-coloured coagula are found sealing up the orifices of the uterine sinuses, and frequently extending into the veins. The structure of the uterus is found to be less dense than natural, and the fibres more distinct. The *os* and *cervix uteri* are covered with echymoses, as if severely bruised; and sometimes small lacerations are observed on the edge. The orifice remains open for some days, but gradually closes. The *vagina* soon recovers its former calibre; considerable heat and soreness of it are experienced for only a short time, unless the head of the child have remained long in the pelvis, or the lochia be very acrid, when they are prolonged or pass on to inflammation of a more or less severe character. The vulva also resumes its natural capacity in a shorter time than might be expected. (See CHURCHILL.)

16. *d. After-pains* require no mention at this place, as they are considered under that head. (See art. AFTER-PAINS.) The *lochia* is merely a continuation of the discharge of blood which attends delivery, and proceeds from the vessels exposed by the separation of the placenta. For three, or four, or five days, it continues of a red colour; but it is much thinner, and more watery than blood, and is not coagulable. It then sometimes becomes yellowish, retaining its serous consistence; but it most frequently changes successively to greenish, yellowish, and lastly to a turbid appearance. The quantity and continuance of this discharge vary remarkably. Of the former no estimate can well be formed; the latter varies much; but the discharge seldom ceases altogether in a shorter period than three weeks, unless in consequence of disease, or continues longer than a month. Its sudden disappearance, and even its short duration, or scanty quantity, are important symptoms of puerperal disease.

17. *e. The several secretions and excretions* are more or less affected during the puerperal states. During parturition the *perspiration* is abundant, but diminishes gradually after delivery; but it usually continues free, and has a faint sickly odour, until convalescence is fully established, when the skin presents its usual state. The *urine* varies in quantity with the abundance of perspiration and of fluid ingesta, and also with the *state of the bowels*, which also vary, owing to their previous conditions and other circumstances. *The milk* is secreted immediately, or soon after delivery. A serous fluid, approaching to, but in some respects differing from true milk, is generally secreted for some time before parturition; and occasionally true milk is secreted during labour, although rarely with first children. In this case the mother can suckle immediately after delivery. But more frequently the milk is not secreted for eighteen or twenty-four, or thirty-six hours, when the breasts enlarge and stinging pains shoot through them. As the parturient shock passes off, and the contracted state of the uterus diverts the vascular determination from this organ, the secretion of milk commences and increases.

18. *f.* With the development of this new function a general disturbance of the system, constituting what is termed the *milk fever*, is produced. The severity and duration of this disturbance are influenced chiefly by the circumstance of the woman's nursing the infant, or discouraging the secretion of milk, and by the state of the bowels and of the other secretions. At first, or about the second, or beginning of the third day, the mammæ are heavier, larger, and tenser, and the patient has slight chills or rigors, followed by heat of skin, soreness of the breasts and acceleration of pulse. With these symptoms the secretion commences, at first slowly and with difficulty, but afterwards more freely. As the secretion becomes more abundant, the above symptoms abate, and in two or three days disappear. The milk first secreted is thicker and richer than that which follows, and acts as an aperient to the infant. (See art. LACTATION.)

19. *B.* DEVIATIONS FROM THE NATURAL AND HEALTHY COURSE OF CONVALESCENCE AFTER DELIVERY. — Dr. HAMILTON justly remarks — 1st, That when there has been unusual suffering during labour, the usual changes after delivery cannot

be expected to proceed in a healthy manner, because the exhaustion of sensorial power must more or less paralyse the actions of every part of the system; — 2nd, That the violent pressure to which the parts concerned in the mechanism of labour have been subjected must occasion a tendency to inflammation; — and, 3rd, That the violent and continued actions of the respiratory organs must render them liable to derangement. But, however influential these causes may prove in occasioning deviations from the ordinary course of convalescence, there are others not the less so, and these consist — 1st, Of disorders previously existing, or occurring during pregnancy; — 2nd, of peculiarity of constitution, or predisposition; — 3rd, Of mental agitation and moral influences; — and, 4th, of numerous circumstances occurring, and of causes coming into operation after delivery.

20. (*a.*) The *nervous shock* may be so very severe as to create alarm. The patient has the aspect of a person in a state of collapse, or extreme exhaustion. The countenance is expressive of anxiety; the senses are either morbidly acute, or, what is still worse, unnaturally dull; the pulse is very rapid, small, and weak, or very slow, laboured, or irregular; and the respiration is hurried, panting, and often more frequent than accords with the state of the pulse. Between this more extreme state of vital shock and the natural state there are numerous grades; and, even in the slighter states, reaction may be long deferred, or may take place imperfectly, or even excessively. In the more extreme states of shock, death may occur in a few hours, without any attempts at reaction being made, the vital sinking proceeding until life is terminated.

21. *Dissection*, in these cases, detects no lesion to account for death. Dr. CHURCHILL remarks, that of several cases of this kind which he has seen, one was tedious, but terminated naturally, and two others were instrumental deliveries. A due estimate of the nervous shock is of great importance in severe cases; for, in most instances, the progress of convalescence is in inverse proportion to the amount of this disturbance. In some persons slight circumstances increase, in a wonderful degree, the susceptibility of impression; and, if this be overlooked, very serious results may follow.

22. (*b.*) The *state of the pulse* is of the utmost importance after delivery. If it continue frequent or very quick, one of two, or even three, things is to be apprehended, even although no other untoward symptom may exist, namely, hæmorrhage, internal or external, or the accession of inflammation, or of puerperal fever. Dr. CHURCHILL observes that, in almost all the cases of flooding after labour, he has found the pulse remain quick, and perhaps full, up to the occurrence of the attack. He might have extended the observation to inflammations and puerperal fevers; seeing that the phenomenon is equally applicable to them and to the commencement of lactation, to after-pains and to the retention of coagula, in some constitutions. The remark of Dr. JOHN CLARKE that no woman should be considered as safe whose pulse exceeds 100 is certainly just; and, I may add, that if the pulse exceed 110, then the risk of puerperal fever or of internal hæmorrhage having commenced, is very great; and a careful examination of all the symptoms of the case should be made, and the coming mischief anticipated, and if possible prevented.

23. When with increased quickness of pulse, it is found that the uterus has not decreased so far in size as might have been expected from the time that had elapsed since delivery, or that, having been diminished, its bulk has increased about the fourth or fifth day, then inflammation of the womb or of its vessels may be expected to declare itself, if it have not already done so, by increased tenderness, by less firmness of the uterine tumour, by the diminution of the lochia, and by the sensations of the patient. These symptoms may, however, be occasioned by the retention of coagula in the womb; which, if retained long, or if not thrown off, by means which will aid the contractile action of the uterus, may cause inflammation or puerperal fever. As tenderness may accompany severe after-pains, it is proper to distinguish between the tenderness thus produced and that which depends on inflammation; and this may be effected by ascertaining whether or no the tenderness continues in the intervals between the pains and contractions which occasion them. If it does continue, inflammation should be suspected, especially if the pulse be quick, and if the lochia has suddenly become scanty or suppressed.

24. (*c.*) The *lochia* rarely deviates from the usual condition without exciting some degree of anxiety in the mind of the patient and physician. This discharge may *cease* a few hours after delivery, after the birth of a still-born or putrid child; and, although putridity of the fœtus may be viewed as risking the healthy condition of the uterus, yet the membranes may have protected this organ, so that no unpleasant symptoms appear. The lochia may also be very *scanty*, yet of the usual duration, as when flooding has occurred; and in this case no further mischief may appear, although a greater predisposition to some other puerperal malady is thereby developed as puerperal fever or mania, &c. This discharge may be, on the other hand, *excessive*, either as to the quantity within the usual time, or as to the prolonged duration of it. After having decreased in quantity and changed in colour, it may suddenly increase, or become even excessive. This is usually caused by sitting up too soon, or walking about; or by the expulsion of a clot which may have obstructed the passage of the discharge through the os uteri. If the lochia change suddenly from a paler to a redder colour, or if a *red colour* return after it has disappeared, the accession of secondary hæmorrhage should be dreaded and guarded against. The passage of the discharge into uterine *leucorrhœa*, which may be permanent, will sometimes occur, and ought to be prevented. The lochia may assume an *acrid* and a very *offensive state*. It is then of a dark or green colour, very profuse and watery, often so acrid as to excoriate the parts, and always very fœtid. These conditions of the discharge are often a sign of disease, but they often also are caused by the retention of a small portion of the placenta, or of coagula, either in the uterine cavity, or in the extremities of the veins and sinuses, or by portions of the decidua which putrify and come away.

25. (*d.*) The *bladder and urethra* may suffer considerably after labour, especially when protracted, and be excessively tender; and redness and ten-

darkness may extend to the *vagina* and *vulva*. This state is often productive of distressing strangury, sometimes with considerable fever.

26. *C.* OF THE MANAGEMENT OF CONVALESCENCE FROM PARTURITION. — (*a.*) *For the natural course of recovery*, the recommendations of HAMILTON, CLARKE, SMELLIE, BURNS, CHURCHILL, and others accord in every respect, and are nearly the same as those which will be here adopted. The patient, after delivery, should be kept for some time in a state of perfect quiet. The room ought to be slightly darkened, and very few persons, except the nurse, admitted. Little or no talking ought to be permitted, unless in an under-tone, and no whispering. The conversation and demeanour of all should be cheerful; and no ill news, frightful stories, or unseasonable communications related. Mental excitement or emotion of every kind is liable to be injurious. The horizontal position must be strictly preserved, and sleep invited. After a few hours' sleep, the nervous system will recover from its shock. The state of the *pulse* ought to be carefully watched, and excitement of it viewed attentively in connection with every sign or symptom of disorder; as it is generally the first to indicate the approach of disease. "Immediately after delivery, it is proper to apply *compression* to the abdomen, by means of a broad binder. This is useful, in the first place, to fix the uterus, and secure its steady contraction; and, secondly, to encourage the contraction of the abdominal parietes. The binder should extend from the ensiform cartilage to the pubes, and be carefully applied for ten days or a fortnight." Immediately after the expulsion of the placenta, a warm napkin ought to be applied to the vulva, and changed at short intervals. "This will afford relief from the smarting pain consequent upon the passage of the child. After some hours, when the patient is recovered, the external parts should be washed with tepid milk and water, containing a small portion of spirit. This must be repeated twice a day, not only for the sake of cleanliness, but to aid in restoring the parts to their natural state." — (CHURCHILL, &c., *Op. cit.* p. 253.)

27. The *horizontal posture* ought to be undeviatingly observed; and however the exact position may be changed, the horizontal state should never be departed from until permitted, and never until after the fourth or fifth day from delivery. The *after-pains* require such attention as is advised in the article respecting them. The *lochia* needs no further attention, than that the napkins should be changed sufficiently often; and that they be applied warm, and so as to prevent the admission of air, especially cold air, to the tender parts, and the action of the air on the internal surface of the vulva. The air in the chamber ought to be preserved in a fresh and moderately cool state, and a fire kept up in order to promote a renewal of air in the room. The bed-clothes ought only to be sufficient to afford a comfortable degree of warmth.

28. *Micturition* should be attempted as soon after delivery as may be felt to be requisite — in from five to eight hours; and it should take place as nearly in the horizontal position as possible. Dr. HAMILTON advises the patient to turn round upon her knees, by which any coagula accumulated in the vagina will readily be expelled. If micturition be neglected too long, the bladder may be paralysed, or inflammation may attack it and extend to the peritoneum, or convulsions may be excited by its over-distension, as I have witnessed in two instances. If any difficulty in evacuating the bladder exist, a warm fomentation to the vulva, or the introduction of the catheter, will remove it. It is the more important that the urine should be voided, when the patient complains of pain in the lower belly, with a desire to pass it, and when the labour has been severe or instrumental.

29. The *bowels* may remain quiet for twelve or eighteen hours after delivery; and if they are not moved at the end of this time, a dose of castor oil, or of senna, or of rhubarb may be given, and, if necessary, repeated. The frequency of repetition must depend upon the state of the bowels previously to delivery, and upon the presence of signs of fæcal accumulations. Dr. HAMILTON remarks, that "unless it be unequivocally ascertained that the bowels have been regularly cleared previous to delivery, a dose of castor oil, or of aloes, with some narcotic if necessary, ought to be given as soon as the woman has recovered from the shock of labour, and the appearance of the stools particularly examined." If indurated fæces be present, the purgative should be repeated every ten or twelve hours, until the bowels are completely unloaded. When the reduction of the bulk of the uterus is tardy, purgatives are more especially required, or an enema, containing the spirit of turpentine and castor oil, may be occasionally administered.

30. If the *breasts* become hard and painful, warm fomentations, frictions with warm oil, or with a slightly stimulating liniment, and a dose of a purgative medicine, are usually advised and repeated, for those cases where the milk is to be discouraged, the woman not intending, or not being capable, of suckling the infant. As soon as the secretion commences, the child should be put to the breast, in order to facilitate the discharge of the milk and to prevent distension. It is better, as Dr. CHURCHILL advises, to do this, even if the patient should not suckle her infant, as it will afford relief. When she is not to suckle, she ought to have every second or third day, according to her strength, till the secretion of milk ceases, and the tension of the mammæ subsides, a dose of some purgative, as rhubarb or senna, with a neutral salt. She ought not to leave her bed, even to have it made, before the fifth day; and, if she be a delicate subject, she should strictly preserve the horizontal position for several days longer. Premature *exertion*, and inattention to *position* and to suitable *diet*, are the chief causes which combine with *impure air*, foul *beds* and *bedding*, and *mental emotions*, to produce the maladies consequent upon parturition.

31. The patient's *diet* should consist chiefly of gruel, arrow-root, sago, rice, milk, whey, panada, weak black tea, with dry toast, or biscuit, and very little butter, for the first three or four days. When the vascular excitement attending the commencement of lactation has subsided, and no disorder is observed, broth, chicken, mutton, or other light articles of diet may be taken on the seventh or eighth day; and wine and water, preferably claret, may be allowed in a day or two afterwards.

32. *b. Deviations from the ordinary progress of convalescence* ought to be promptly attended to, and cautiously treated.—*α.* If the *vital shock* be extreme, or even severe, small doses of opium, with camphor, ammonia, or musk, should be frequently administered, and the quantity of each duly proportioned to the frequency of exhibition and the urgency of the case. These substances are preferable to wine or brandy, as they procure sleep, quiet the pulse, and prevent the subsequent reaction from being excessive; whilst the latter may occasion fever, or distressing headach, or even mania. In this emergency, perfect moral and physical quietude should be preserved. As the shock subsides, suitable nourishment and restoratives are requisite.

33. *β. Increased frequency of pulse* ought always to excite suspicions and the strictest investigation. If the patient suffer from gastro-intestinal irritation, the cause of frequency is thereby manifested, and blue pill, or the grey powder, with DOVER'S powder, should be prescribed and repeated according to circumstances. If fæcal matters have accumulated in the bowels, the purgatives and enemata already mentioned are required. If the quickness of pulse still continue, the states of uterine contraction and of the lochia ought to be examined, with the view of detecting the commencement of disease in the uterus or its appendages, or in the peritoneum.

34. *γ. An acrid or morbid state of the Lochia* is apt to occasion irritation, excoriation, or even inflammation of the vagina and vulva, with smarting and itching. In this case, extreme cleanliness, frequent bathing, warm diluent vaginal injections, lotions, containing lead, or the black-wash, or the sulphate of zinc, may be employed; the simply diluent injections being first used; and the others subsequently or after the lochia has become scanty, or about to disappear, lest suppression of the discharge should be produced. The injections ought to be warm, and if the lochia be very offensive, a small quantity of creasote, or of chloride of lime, or chlorinated soda may be added. During the treatment, the *binder*, above recommended, should be duly and carefully applied. When the lochia becomes *excessive* or *prolonged*, nutritious diet, tonics, as the preparations of cinchona, or quinine or chalybeates, or the tincture of the muriate of iron, ought to be allowed, after a due time from delivery has elapsed. When the discharge becomes excessive or changes in colour after having nearly ceased, the patient should be confined to the horizontal posture. In all these circumstances, and especially when the lochia is excessive, prolonged, or likely to pass into uterine leucorrhœa, the occasional administration of an enema containing oil of turpentine, or embrocations with this substance, applied either above the pubis or over the sacrum, will be of service.

35. v. OF THE INFLUENCES AND AGENTS FAVOURING, PREDISPOSING TO, OR EXCITING PUERPERAL DISEASE. — The same *causes* may produce any of the acute maladies incidental to the puerperal state; the particular malady being determined by the peculiar combination of causes, and of circumstances, aiding the development of the effects of these causes, by the constitution, habit of body, and state of the patient previous to, and during the parturient process, and by the changes consequent upon delivery — by these last more especially than by others. The remarks which have been offered above on the several changes and varying states and circumstances tending strongly to predispose the female frame to the invasion of the exciting causes of acute disease, will sufficiently show the marked liability to such disease which these changes and states create, even in the more favourable circumstances in which she may be placed. But when it is considered that, with these successive changes, various mental emotions have been and continue in operation, — fear and anxiety in most cases, and the most depressing of the moral sentiments in some, — these changes must be viewed as receiving therefrom the most important aids towards the development of serious morbid effects. To these, moreover, are often added the influences of diet and regimen, not always the most suitable to the successive states of advanced gestation, and of parturition, and more especially to the period immediately following delivery; the still more active agency of close, impure, and miasmatous air, of foul exhalations, and of imperfect ventilation; and the contingent operations of infectious effluvia, variously generated, and as variously conveyed and propagated.

36. Amongst the poorer classes, and even among the richer in some localities, the moist, putrid, and contaminating emanations from the numerous sources with which all cities and large towns more or less abound, are productive of the more malignant of the maladies incidental to the puerperal state. These sources have been fully described, and their influence shown, in the articles INFECTION and PESTILENCE, *protection from*. But the most malignant operation of a foul or contaminated air is shown in lying-in hospitals, where every patient which enters them, at certain seasons or times, is seized with puerperal fever, or some other acute and often fatal disease. If the wards of a lying-in hospital contain more than four beds; if these wards are placed too close to each other; if they be not lofty and ventilated by a thorough current, by open fire-places, and by fires; if they be too closely shut during cold and moist states of the air; if the discharges be not quickly removed, and the cloths imbibing the lochia be not frequently renewed; and if the bed-clothes and bedding be not perfectly clean and duly purified, the more malignant forms of puerperal disease will soon make their appearance, owing to the generation of a morbid, an infectious, and a contaminated effluvium, by puerperal females and by their discharges, in too confined and insufficiently ventilated apartments. This effluvium, when once generated, may be conveyed by the clothes, or by other media, and may infect others so circumstanced as to be contaminated by it. Of this fact I have known numerous proofs, which will be noticed in the sequel.

37. There is every reason, moreover, to believe that lying-in hospitals are not the only source of the fevers which render these institutions a greater curse than a benefit to the community; for I have seen reasons for inferring, that the foul air extricated from the numerous sources of impurity, contamination, and death with which this city and others abound, and which I have described under the heads referred to above, especially when undiluted by due ventilation, or when accumulated in a humid, still, and confined atmosphere, and

when admitted to, and acting upon, the recently delivered female, will so depress organic nervous power, and so contaminate the circulating fluids, as to develope puerperal fever of a malignant character, which may, in its turn, generate an effluvium productive of a similar malady in other puerperal females when communicated to them.

38. The contaminating effluvium, or infected atmosphere, productive of the more violent states of puerperal diseases, and the sources from which such effluvium proceeds, cannot be disputed; but its modes of invasion and operation are not quite so manifest. I believe, however, from what I have observed, in the different circumstances in which this effluvium or contaminated atmosphere has been generated, that its modes of invasion and operation differ materially according to the concentration of this cause, and to the circumstances favouring its invasion in one way in preference to another. Thus, in the more concentrated state of the effluvium, as generated in the crowded wards of a lying-in hospital, during a cold and humid state of the air, and when due ventilation was prevented, I have seen females without any complaint, and dead within twenty hours afterwards; and, on dissection, neither the uterus nor its appendages, nor the peritoneum, has presented any manifest lesion, or any change more evident than that of other organs; the chief alteration being a fluid and dark state of the blood, some congestion of the lungs, and enormous flatulent distension of the alimentary canal. (See hereafter.) In these cases, which were observed as closely as I was able, I attributed the intensity of the operation of the poison to its being respired with the air, to its operation on the nervous system and blood, to its contaminating the fluids, and to its impairing not only the crasis of the blood, but also the vital cohesion of the tissues, as evinced upon dissection, even before the body had entirely cooled.

39. In other circumstances, when the morbid or poisonous effluvium appeared to be less concentrated, and to be productive of a less malignant or less rapidly fatal disease, and where there was less crowding, and better ventilation of the wards, the effects were different both as to their procession and as to their issue. The appearances after death were varied, and were most remarkable in the peritoneum, or in the uterus, or in the uterine sinuses, or in the veins of the uterus and its appendages; and, in respect of these cases, I have doubted whether or not the poisonous effluvium or emanation had invaded the frame through the respiratory organs, or by the vulva and vagina, or by both avenues. It may be viewed as a somewhat extravagant notion to suppose that an agent disseminated in, and conveyed by, the air can contaminate or infect the frame by the latter avenue—by the vagina. But if the effects of the admission of even pure air into the cavity of an abscess, and the difficulty of preventing this admission on occasions of opening psoas and lumbar abscesses, and of puncturing empyema, be duly estimated, the probability of air finding admission by the vagina to the uterus will be admitted, especially when the states of these parts for some days after parturition is considered. If, then, the air already poisoned or contaminated thus finds its way into either the vagina or the uterus,—an avenue much more patent than the opening into a chronic abscess, &c.—it will necessarily occasion, in the puerperal state, effects even more remarkable than when admitted into other cavities; for the already infected air will contaminate not only the discharges retained in these situations, rendering them still more injurious and infecting, but also the surfaces with which they come in contact, and which, as respects the uterus, resemble those of a recent wound, and, as regards the vagina, are excoriated, tender, or inflamed.

40. If the production of dangerous states of puerperal disease by this local contamination be admitted, the very intimate connection between certain forms of puerperal fevers and erysipelas will be further demonstrated thereby; whilst, on the other hand, this admitted connection between these maladies will evince the high probability of this mode of infection and contamination. It is extremely probable, moreover, that the vital depression produced by the foul air respired by the puerperal female, or even by an infecting effluvium communicated by the clothes of an accoucheur, will so influence the state of the recently-delivered uterus as to give rise to further changes:—1st. To imperfect contraction of the uterus and impaired tonic action, and to the slow return to the natural states of the vagina and vulva;—2d. To an altered, contaminating, or morbid state of the lochia;—3d. To a more marked disposition to the absorption of such parts of this altered discharge as may be retained in the uterus or vagina;—and, 4th. To the prominent changes observed after death in the uterus, its appendages, and peritoneum.

41. VI. THE CAUSES OF THE SERIOUS NATURE OF ALL, AND THE VERY DANGEROUS TENDENCY OF SOME, PUERPERAL DISEASES, will readily appear from what I have already advanced respecting the changes experienced by the female frame in connection with the puerperal state, and the nature of the influences and agents to which the female in this state may be exposed. The shock which the vitality of the frame has received during parturition, its manifest effects on the nervous system of some females; the predisposition to fever, mania, or convulsion which it occasions; the sudden removal of distension and of pressure; the as sudden change in the state of the vascular system, as respects both fulness or deficiency, and distribution or determination of blood; the continuance of weakening discharges, and of depressing mental emotions; the alterations in the secretions and excretions; and the organic disposition of the sexual organs and adjoining tissues and viscera to experience structural change during the puerperal states,—all and severally tend to impart a serious or dangerous character to the diseases which occur during these states.

42. But it is not only to the changes, which the female constitution undergoes, in the puerperal states that the severity of the diseases incidental to those states are to be imputed, but also to the nature of the causes which produce these diseases, and to the pathological changes which necessarily follow, if they be not arrested by prompt and active measures at an early period of their progress, and before the fluids become contaminated, and the predisposed structures disorganized or altered. The diseases, also, with which puerperal females are affected, whether those following the operation of the common or physical causes, of

those induced by the imbibition and absorption of morbid secretions or excretions, or by infectious effluvia, are seldom simple or uncomplicated — are not confined to the nervous system, or to the vascular system, or to the sexual organs, or even to several of the abdominal viscera, — but extend to all the general systems, implicate both the nervous and vascular systems, change the vital and physical conditions of the blood, and affect, in a more or less prominent manner, the generative organs and peritoneal surface, which in many cases manifest the greatest amount of organic lesion. It is obvious that diseases of so complicated and general a character, affecting the chief factors of life, changing the conditions of vital fluids and of vital organs, attacking the frame at that period of existence, and in that condition, which are the most liable and open to their invasion, and in which the vital energies are the least capable of resistance, will, in these circumstances, make a rapid, a dangerous, and often a fatal progress.

43. vii. OF THE PREVENTION OF PUERPERAL MALADIES. — The remarks which I have offered above on the management, both of the natural course of convalescence after delivery, and of the slightest deviations from it (§§ 26—34.), and on the chief causes of the most important of puerperal diseases (§ 35, *et seq.*), will have already shown what the chief means of prevention are, and that they should have strict reference to the management of convalescence and to the treatment of those early deviations, as well as to the careful avoidance of those more noxious causes to which puerperal females may be exposed. Indeed an early and judicious treatment of the slighter deviations from the usual progress of convalescence, and avoidance of the infectious or contaminating causes constitute the chief means of prevention that can be adopted. Yet there are certain of these causes, and more especially of the sources whence they spring, which receive insufficient attention, and until lately have received no attention at all, even from those who consider themselves expert, beyond all others, especially in matters which they view as their own particular province, and as being above all the rest most important. I believe that the chief sources of puerperal fevers, particularly of their more malignant forms, are lying-in hospitals, in which not only a very large proportion of those who are received become infected, but also from which the infection is carried abroad, not solely by the females who go out, but also by the clothes of the dead and of those who recover, and by the persons and clothes of the medical attendants. The charitable would much more wisely and humanely contribute their bounty for the promotion of cleanliness and comfort in the chambers of the poor, and for enabling the objects of their bounty to be delivered in their own houses, with requisite and healthful appliances and aids, than in causing them to be transported to sources of contamination, contingent infection, and in no very small proportion, even of death.

44. The importance of removing, and of avoiding, when removal cannot be attained, the several sources of infectious effluvia which have been mentioned, under the several heads already referred to, was not the less obvious because it was so generally overlooked, previously to the appearance of those parts of this work, in which the injurious effects of these sources of contamination were treated of; and even now they have not received the least attention as respects their influence in causing the more important maladies incidental to the puerperal state. The nature, the number, and the concentrated agencies, of these sources are now too manifest to require description; but there is at least one to which insufficient attention — or indeed no attention at all — has been directed, namely, the impure state of the *bedding* used by many persons of the middle classes, and of those below them, although not the poorest. The beds, consisting chiefly of feathers or wool, always of animal substances — having imbibed the effluvium and perspiration of the persons who have slept on them during many years, or even during generations, without having once undergone purification, — have become more or less contaminated by the continued use; and it cannot, therefore, be a matter of surprise if, in certain occasions of prolonged occupation, and in some atmospheric conditions, an effluvium should be evolved from them, productive of infection or contamination to the susceptible and predisposed puerperal female. That a contaminating effluvium is actually evolved from foul beds in these circumstances, I believe, because I have seen proofs of this cause of dangerous disease; and hence more notice should be taken of this source of human and especially of puerperal infection than it has hitherto received. It is not improbable, that puerperal females are not the only sufferers from this cause, and that puerperal fevers are not the only diseases which may occasionally originate in this source, but also that erysipelas, typhoid fevers, and other febrile and infectious maladies, may often be produced by the same causes, both in the wards of an hospital, and in the close and impure sleeping apartments and beds of the poorer classes, and even of those next above them, when the infection becomes more generally diffused.

45. II. OF THE LOCAL AND FUNCTIONAL DISEASES INCIDENTAL TO THE PUERPERAL STATE. — Several of these diseases are treated of under distinct heads. *Phlegmasia dolens, puerperal convulsions, uterine hæmorrhages*, and *puerperal mania* have separate articles assigned to them. (See arts. CONVULSIONS, § 27, *et seq.* HÆMORRHAGE, UTERINE, and INSANITY, PUERPERAL,). The disorders incidental to the *mammæ* and to the secretion of *milk* are considered in the articles LACTATION and MAMMÆ. It therefore only remains for me to notice at this place, certain *lesions* of the sexual and adjoining organs which are apt to occur, during and subsequent to parturition, and the *fevers* to which puerperal females are liable.

46. i. STRUCTURAL LESIONS CONSEQUENT UPON PARTURITION.

CLASSIF. — IV. CLASS. IV. ORDER (*Author*).

47. *A.* SANGUINEOUS TUMOUR OF THE VULVÆ. *Sanguineous tumour of the labia*, CHURCHILL. — *Sanguineous extravasation into the labia*, CROSSE. — *Effusion of blood into the cellular tissue of one or of both labia* is of rare occurrence. It has been observed and described by MACBRIDE, MAITLAND, DENMAN, BURNS, MERRIMAN, DEWEES, HAMILTON, CROSSE, and others.

48. The effusion may not be limited to the

vulva, but may extend into the pelvis, and downwards to the perinæum. It may occur during labour, previously to the delivery of the child, as in Dr. MAITLAND's case; but much more frequently immediately afterwards. The tumefaction is generally sudden, and increases rapidly. The size varies much, and has even reached that of a child's head. Dr. CHURCHILL, quoting M. SCHEDEL, states, that as much as six or seven pounds of blood have escaped.

49. *a.* It is *caused* by the rupture of some vessel or vessels, by the pressure of the child's head whilst passing through the pelvis; and most probably the ruptured vessels have been in a varicose or disordered state previously. "Dr. BURNS supposes some of the vessels of the nymphæ to be ruptured; Dr. DEWEES, that the vessels of the vagina give way; and Drs. DAVIS and CAMPBELL, the pudic vein." But there is not sufficient reason to assign it to any particular vessel. It most probably arises from the rupture of several small varicose veins. This lesion has usually followed natural labours.

50. *b. Symptoms.*—The patient's attention is first directed to it, by the swelling of the labia, and by a sense of weight and of bearing down. On examination, one or both labia are found distended, sometimes enormously, and the labium everted, so that the tumour appears partially covered by the mucous membrane. The colours livid, or nearly black. The parts are extremely tender, and the pain is very great. The tumour increases rapidly until it covers the vulva and perinæum. Dr. CHURCHILL states, that a considerable degree of fever is present: the pulse becomes quick, the skin hot, and the head pained; there is sometimes also delirium. Retention of urine, from the pressure of the tumour on the orifice of the urethra increases the distress. The patient lies on her back, scarcely able to move, with the thighs widely separated, unable to bear even the pressure of the bed-clothes (DEWEES). After a few hours, relief is obtained by the rupture of the labium, which always takes place on its inner surface, and by the discharge of blood. A small portion of this surface begins to slough, and part of the blood escapes; but, some coagula remaining, the wound becomes offensive from their decomposition. The slough and remaining coagula are afterwards thrown off, and the parts generally heal by degrees.

51. The rupture of the tumour rarely takes place during the labour; but in this case, as well as in others where it occurs before the blood is coagulated, the hæmorrhage is so great as to occasion fainting, or even death, as in the instances adduced by PHILLIPART, CROSSE, NAEGALE, SCHEDEL and others. If the tumour be very large, before the birth of the child, it proves so serious an obstacle as to require surgical interference. This tumour cannot be mistaken for *hernia;* the rapidity of its appearance, the period of its occurrence, its size and colour sufficiently distinguishing it from hernia. It has been mistaken for the distended membranes, and punctured with this idea; but the bag formed by the membranes can be isolated from the labia and traced up to the os uteri. Besides, this tumour generally does not occur until after delivery.

52. *c.* The *Treatment* is evidently to give as early an issue as possible after the blood has coagulated to the contents of the tumour. If the risk of hæmorrhage before coagulation be considered so great as to prevent an opening being sooner made in the tumour, the urine ought to be drawn off, and an enema, with an ounce, or an ounce and a half of oil of turpentine administered. In no case should this enema be withheld, and rarely ought an incision into the labium be delayed longer than two or three hours. When the small coagula infiltrating the cellular tissue causes an offensive discharge, then lotions with vinegar, water and creasote, or with chloride of lime, or charcoal poultices, may be employed. If hæmorrhage continue, or return, the turpentine clyster should be repeated, and compresses, moistened with oil of turpentine, applied. The bowels ought to be kept open, and the febrile and other symptoms treated according to general principles and the peculiarities of the case.

53. *B.* LACERATION OF THE PERINÆUM. This accident is varied in extent. Where it is slight, if may not materially interfere with the comfort of the patient, but when it is extensive it is a cause of almost constant distress. It occurs most frequently during first labours.—*a.* "The exact *situation* and *extent* of the rupture vary with the cause and the circumstances of the case.—1st. It may commence at the anterior border and extend *to* the sphincter ani, and this is the most frequent extent.—2nd. The rent may involve the entire perinæum, and extend through the sphincter ani, laying the cavities of the rectum and vagina into one.—3rd. The central space of the perinæum is sometimes ruptured, leaving the anterior edge and the sphincter ani untouched." Both the child and the placenta may pass through this central laceration, or completely *per anum.*—4th. The recto-vaginal septum, sphincter ani and part of the perinæum may be torn, so as to permit the passage of the child, leaving the anterior portion of the perinæum entire.

54. *b.* The *causes* are deviations from the ordinary mechanism of parturition; mal-conformation of the passages, or of the soft parts; exostosis or tumours in the pelvic cavity; excessive violence of the pains, and the too rapid passage of the head of the fœtus; great breadth, or extreme rigidity, or great weakness of the perinæum; mal-position of the child's head, or mal-presentations; and mismanagement or want of care, especially when instruments are used. Thus it will appear, that this accident cannot always be prevented.

55. *c.* The *symptoms* and *consequences* of laceration depend upon the extent of it. If the injury be slight, no ill effects may probably result. But if it extend to the sphincter, the patient complains of want of support, and is liable to procidentia of the womb. If the recto-vaginal septum be torn the state of the patient is most distressing. The fæces, for some time at least, pass through the vagina involuntarily; and the utmost attention to cleanliness is required, but cannot always prevent most distressing annoyances. When slight, the rent commonly contracts, and heals without interference, after a short time. Even when the recto-vaginal septum is torn, partial union may take place and leave only a fistulous opening. Dr. BURNS remarks, that a valve may ultimately be formed, so that the patient may be partly relieved of her infirmity. But frequently the lochial discharge passing over the wound prevents the natural pro-

cess of cure, and the torn surfaces become callous, or degenerate into ulceration in consequence.

56. *d.* The *prevention and treatment* of this accident are fully discussed in works on midwifery and surgery. To these I must refer the reader. But I may remark, that slight cases require only cleanliness: the part will heal of itself, and the patient may not even suspect what has occurred. Even when the laceration is more considerable, all that may be required is, to give at first, one or two active purges, and afterwards allow the bowels to become costive, to observe strict cleanliness, and to keep the patient in one position, so as to preserve the edges of the wound in contact. If these means do not succeed, a binder may be passed around the hips, and a pad on each side of the perinæum, so as to preserve the edges of the wound in apposition. Sutures of different kinds have been employed, and have succeeded in rare instances. After sufficient purging, it may be advisable to give opiates, so as to cause costiveness for a few days, and thereby to aid in the restoration of the parts. The catheter must be passed twice or thrice daily, and means used to absorb entirely the discharge. The *diet* should be spare, and chiefly farinaceous. Perfect quietude is necessary. In the various circumstances in which a failure, partial or complete, of the above means may occur, the assistance of the surgeon and mechanist will be required.

57. C. RUPTURE OF THE UTERUS AND VAGINA. —This fatal occurrence may take place during parturition, during pregnancy, and at an advanced period of life, of course unconnected with pregnancy; this last being the rarest. Dr. CHURCHILL adduces statistical details of this accident, from which it appears, that Dr. COLLINS met with thirty-four cases out of 16,654; that sixty-five cases occurred in an aggregate of 42,768 patients, or about one in 657. Dr. BURNS says, that it happens about once in 940 cases. It is not so often met with in first as in subsequent pregnancies. Of seventy-five cases, nine occurred in the first pregnancy, fourteen in the second, thirteen in the third, and thirty-seven in the fourth and subsequent pregnancies.

58. *a. Causes.* — 1st. *During gestation*, it may arise from that form of extra-uterine pregnancy called *interstitial fœtation;* the ovum being retained, in passing the fallopian tube into the uterus, between the uterine fibres, where, as it grows, it occasions the absorption of that portion of the uterine parietes, which at last gives way, and allows the fœtus to pass into the abdominal cavity. Rupture of the uterus may also proceed from disease, as from inflammation, softening, or suppuration of a portion of the walls of the organ; or it may be produced by accidents, blows, falls, &c. It may even occur without any assignable cause, unless it be then occasioned, as Dr. BURNS supposes, by irregular action of the fibres of the uterus.

59. 2d. *During parturition:* it may also arise from pre-existing disease, and especially from any one of the usual consequences of inflammation. A portion also of the uterus may be atrophied, softened, or thinned by the pressure of the child against it, or by pressure of some part of the abdominal or pelvic parietes, so as to yield during the uterine contractions of parturition. DUPARCQUE mentions scirrhus of the uterus as one of the causes of rupture; but this is doubtful. When partial inflammation of the uterus has existed during gestation (§ 58.), then the laceration has usually corresponded with the situation of the previous pain, marking the seat of inflammation. There can be no doubt that a perfectly healthy uterus is rarely or never ruptured. In one case M. MALGAIGNE attributed the rupture to the administration of ergot of rye.

60. *b.* The *period* of labour at which rupture may occur varies: "it may be at the beginning—before the rupture of the membranes; during the passage of the head through the pelvis; or in the moment when the child is delivered." Narrowing of the upper outlet may give rise to it; or any other mechanical obstacle opposing the actions of the uterus; or even oblique positions of the womb. The age of the patient has but little influence in predisposing to rupture.

61. *c.* The rupture may only be *partial*, some one of the tissues of the uterus giving way either previously to or during labour, probably owing to antecedent disease, or to peculiarity of structure. The peritoneal coat alone may be torn, or the muscular coat may be ruptured, the peritoneal covering remaining uninjured. Dr. COLLINS met with nine cases of this description. Although the extent of lesion is less in such instances, yet Dr. CHURCHILL considers it to be equally fatal. And as in other forms of rupture it may be caused by external injuries, by excessive movements of the child, by over distension, &c.

62. Violence in turning the child may cause rupture; "and it may accompany this operation, in certain states of the cervix uteri, without any fault of the operator." Rigidity of the os uteri, or imperforation, may also occasion laceration. Several instances are recorded in which the os uteri was torn completely off during labour. Pressure at the brim of the pelvis rendering the cervix uteri thinner or softer than natural, and more easily torn, has been assigned for this occurrence.

63. 3d. *At an advanced period of life* the structure of the cervix uteri is more or less changed, becoming dense, cartilaginous, and the canal reduced in size, or even obliterated. The outlet for the escape of secretions accumulated in the uterine cavity is thus closed; and if the quantity collected be sufficient to distend the organ, some portion of the walls experiences absorption and thinning, or inflammation and softening. Thus an opening, or perforation, may be made by absorption, or by rupture, into the peritoneal sac.

64. *d. On dissection* the torn edges, and the parts immediately adjoining, usually exhibit marks of disease, when the rupture has proceeded from this cause, the laceration in such cases occurring in any part of the organ. "When the rupture is the result of mechanical causes, it generally takes place near the cervix, and involves both the uterus and vagina," the part which gives way being usually near the union of the cervix with the vagina. The wound is commonly transverse. Of twenty-three cases, Dr. COLLINS found one on the right, one on the left side, eleven posteriorly, and ten anteriorly. The structure of the uterus is hardly altered — is firm in texture, and natural in colour, except a few ecchymoses. The edges of the laceration are jagged or uneven. In very rare instances the bladder has also been ruptured. When the *peritoneal surface* of the uterus has

alone been torn, several small lacerations, resembling scarifications, from a quarter to half an inch in length, and one or two lines in depth, are found. They are attended by the effusion of blood in the peritoneal cavity, and by the usual appearances and products of peritonitis, which are caused by the effused blood and the injury. When the *muscular substance* is alone torn, there may or may not be found evidence of pre-existent disease. The peritoneal covering is generally inflamed, and blood is found effused in the cavity of the uterus. Laceration of the *cervix uteri* is accompanied with a bruised appearance; its edges are ragged and uneven, and the parts immediately adjoining red and swollen. The connection between the cervix and vagina is not compromised. In cases of rupture of the uterus in *old persons* (§ 63.), the viscus is rather perforated than ruptured; the changes caused by the contents, and the softening and thinning of a portion of the parietes appearing more like perforation than rupture. *Peritonitis* always follows rupture of the uterus, if the patient survive the shock.

65. *e. Symptoms.*—The symptoms vary somewhat with the extent of the rupture—according as the peritoneal, or the muscular coat is singly torn. The circumstances which may suggest fears of rupture are the occurrence of partial inflammation of the uterus during gestation, and the existence of violent labour-pains in patients with a narrow, or mal-formed pelvis. "Rupture of the uterus and vagina is marked by an acute, sudden, and intolerable pain, like cramp; a sense of some part bursting, giving way, or tearing, with an audible noise, according to the testimony of the patient; the suspension of the labour-pains; hæmorrhage from the vagina; and by a rapidly succeeding state of collapse." (CHURCHILL.) All these symptoms may not be observed in some cases, but the pain and collapse are never absent. When one of the coats alone is torn, the labour may continue if it be the peritoneal coat, and there may be no hæmorrhage. In such cases, Dr. RAMSBOTHAM remarks that the symptoms of actual rupture of the uterine structure are observed in a diminished degree, excepting the escape of the child.

66. Rupture of the uterus is always attended by continued and extreme pain; nausea and vomiting supervene,—at first of the contents of the stomach, then of a greenish, and lastly of a dark, or coffee-ground-like matter; the countenance becomes pale, anxious, and ghastly; the surface and extremities cold and clammy; the pulse rapid, small, and weak, or fluttering and irregular; respiration is hurried, panting, and anxious, with a desire of fresh air; and hæmorrhage takes place from the vagina, varying much in quantity. The shock or collapse characterising these cases is owing more to the nature and severity of the injury than to the amount of hæmorrhage which may follow, although this is sometimes very considerable; but both conditions contribute to this result. When the rupture is complete, the child passes through the opening into the abdominal cavity, either partially or wholly, where it may be felt through the abdominal parietes, and the efforts at expulsion cease. If the presentation was within reach before the accident, it cannot now be ascertained. Dr. CHURCHILL refers to instances of a loop of intestine having passed through the rupture, when complete, and become strangulated. The state of collapse may continue for some time, if it do not prove fatal. But, at length, reaction takes place to a certain amount, and the usual symptoms of peritonitis appear: exquisite tenderness, pain, and flatulent distension of the abdomen; pulse small, hard, rapid, and, lastly, weak; decubitus on the back, with the knees drawn up; hurried respiration, anxious and collapsed countenance.

67. *f.* The *terminations* of ruptured uterus are —1st. Death a few hours after the shock, or after delivery;—2d. Death from peritonitis;—3d. Death from consecutive lesions;—and, 4th. Recovery. In by far the greater number of instances, the accident proves fatal. The aggregate of cases observed by SMELLIE, J. CLARKE, MERRIMAN, M'KEEVER, RAMSBOTHAM, COLLINS, and BEATTY, amounting to sixty-eight, furnished only six recoveries. OSIANDER, VELPEAU, and CHURCHILL quote several cases of recovery; but instances are very rare in which recovery has taken place when the fœtus has remained in the peritoneal cavity. (DUPARCQUE.) In cases of interstitial fœtation, also, patients have very rarely survived both shock and consequent inflammation. In all cases, therefore, of ruptured uterus, the *prognosis* is very unfavourable.

68. *g. Diagnosis.*—The sudden and acute pain, the cessation of labour, the collapse, and the recession of the child, sufficiently indicate the nature of the mischief. When, however, the rupture is partial, the diagnosis is much more difficult. The sudden pain, collapse, and consequent peritonitis, are the chief symptoms of rupture of the peritoneal coat; the pain, collapse, cessation of uterine action, and vaginal hæmorrhage, being the principal indications of rupture of the muscular coat. The sudden occurrence of peritonitis in *old women* may excite suspicions of perforation or rupture of the uterus, but certainty can be arrived at only by a *post mortem* inspection.

69. *h. Treatment.*—When rupture of the uterus is recognised, the propriety of immediate delivery cannot be disputed. Common sense and experience, as evinced by the results of recorded cases, support this practice. When the os uteri is undilated, instant delivery cannot be effected; but the measures to be adopted on this emergency, as well as in others connected with the delivery, especially when the child has passed through the rent into the abdominal cavity, come not within the scope of my work. The means which should be administered during the continuance of the vital shock, or collapse, are camphor, ammonia, and opium, in such doses as may be just sufficient to support the powers of life without inducing inordinate reaction. If peritonitis supervene, calomel, camphor, and opium; terebinthinate embrocations applied over the abdomen; opium in large doses, and the other means recommended in cases of *inflammation of the* PERITONEUM (§ 138, *et seq.*), should be prescribed, bearing, however, in recollection, that the large loss of blood usually occasioned by the rupture, as well as the shock sustained by the vital powers, prevents either depleting or depressing measures from being too freely employed.

70. *D.* INFLAMMATION OF THE VAGINA.—Inflammation of the vagina may occur, independently of the puerperal state, or it may arise from specific causes, or infection, as shown in the ar-

ticle Vagina.—(*a.*) It is of frequent occurrence after delivery, in various grades of severity. It may consist merely of slight soreness or excoriation, or irritation, and follow an ordinary or natural labour, and speedily subside, unless it be prolonged or exasperated by an acrid state of the lochia. When, however, the head of the child has remained a long time in the pelvis, pressing on the soft parts, or when the narrowness of the passage has created great difficulty, or when the presentation has been unnatural, or when instrumental aid has been required, the vagina is then liable to experience most severe inflammation, the consequences of which may be most serious.

71. (*b.*) The *symptoms* generally commence with a smarting pain, more severe than that usually following delivery, soon passing into a sense of painful heat and scalding, extending from the external parts up the vagina. There is also a feeling of fulness and weight in this situation. On examination, the external parts appear swollen and bruised, with increased heat, and acute pain or tenderness, when touched. On averting the labia, the vagina presents large rugæ, of a bright red colour. At first, the discharge from the inflamed surface is scanty, but it afterwards is purulent, or pus may be detected, mixed with the red lochial discharge. If the discharge have become more colourless, the puriform secretion from the vagina renders it more opaque. With the local increased action, more or less of symptomatic fever is present; and, in the more severe cases, this fever may assume a very serious aspect.

72. (*c.*) The *terminations* are sometimes serious. The slighter cases, or those which receive prompt and judicious treatment, usually terminate in *resolution*. The decrease of pain, and of the local and constitutional symptoms, is the chief indication of this issue. *Suppuration* and *ulceration* are not infrequent. When the injury causing the inflammation has been severe, or the attack violent from the first, suppuration advances rapidly, is attended by a copious puriform discharge, and, in the course of a very few days, is followed by the appearance of a number of sloughing ulcers, or rather of several partially detached portions of sloughing mucous membrane. As these separate, the parts which they covered appear deprived of this membrane. If the *sloughing ulceration* be more severe, the coats beneath the mucous coat may be invaded; and it is then not uncommon to find the posterior part of the neck of the bladder attacked, and even an opening formed in this situation,—a *vesico-vaginal fistula*; or to find a similar sloughing ulcer into the rectum,—or a *recto-vaginal fistula*, to be formed. When sloughing ulceration appears, the greatest care may not succeed in preventing these consequences from occurring.

73. *Gangrene* may rapidly follow when the pressure on the parts has been prolonged or excessive. In these cases, the separation of the sloughs is generally followed by vesico-vaginal fistula; more rarely, by recto-vaginal fistula. In 1845, a lady, who had experienced the most unaccountable neglect whilst in the care of a surgeon in the East Indies, but who was perfectly well-formed, came to London for the advice of the author and the late Mr. Liston. Most extensive recto-vaginal and vesico-vaginal fistulæ co-existed in her case. She had been a strong and healthy person, previously to her protracted confinement in the East. When she came to London, the urinary bladder, the vagina, and the rectum formed a single cavity. The case was far beyond any measures, excepting mechanical aids, and strict attention to cleanliness.

74. (*d.*) *Treatment.*—The usual antiphlogistic means, appropriate in kind and extent to the violence of the inflammation, and the habit of body and constitution of the patient, are required at an early stage. Dr. Churchill has found *tartar emetic*, conjoined with a saline aperient, of great use. It should be given so as to nauseate, without producing vomiting. "The external parts ought to be well fomented two or three times a day; and, during the intervals, a large poultice may be applied over the vulva. Twice or thrice daily, also, the vagina should be syringed with tepid milk and water, or a weak solution of acetate of lead. After the sloughs have separated, a careful examination should be made every second day, to ascertain the progress of healing; and when the surfaces begin to be covered with new membrane, we must take measures for preventing the formation of cicatrices. This can be done only by the repeated introduction of bougies, and the best kind are tallow or wax candles. At first a small-sized one should be oiled and introduced, night and morning, and allowed to remain a quarter of an hour. Afterwards, as the tenderness diminishes, the size of the candle should be increased; and it ought to be introduced oftener, and retained longer. The warm injections should be continued, and the milk and water may be changed for some slightly astringent fluid."—(Churchill, *Op. cit.* p. 281.) When sloughing ulceration or gangrene exists, a restorative or tonic treatment, and light nutritious diet, are required. The unfavourable consequences of these changes — *vesico-vaginal*, or *recto-vaginal fistula* — are sometimes remedied, when not very extensive, by surgical treatment. For the measures which may be attempted for these distressing lesions, I must refer the reader either to surgical works, or to the systems of midwifery practice referred to hereafter; and more particularly to Dr. Churchill's work. (See art. Vagina for other lesions not necessarily proceeding from the puerperal state.)

75. *E.* Inversion of the Uterus.—*The inside of the uterus may be turned out, and either drawn or pushed down into the vagina.* It may take place in different degrees, and form what has been called — 1st. Simple depression; — 2d. Incomplete inversion, when the fundus uteri is merely engaged in the orifice; — and, 3d. Complete inversion, when it protrudes from the vagina, with the mouth turned upwards. The vagina, in this latter case, is also partly reversed, so that the tumour is often of considerable length. When the inversion is only partial, the tumour is retained altogether, or chiefly within the vagina, the fundus protruding in part through the os uteri.

76. (*a.*) *Symptoms.*—The patient with inversion of the uterus feels severe and obstinate pain, accompanied with bearing down efforts, by which a partial inversion is sometimes rendered complete. She is very weak; her countenance is pale and anxious; and her pulse is feeble, small, or almost imperceptible. Hæmorrhage is generally present, and is often most profuse. It is

frequently scanty, or absent, when the inversion is complete; although a very partial inversion may be attended by a fatal discharge. A sense of dragging at the epigastrium, or of a dragging downwards of the bowels, is usually present; and fainting and convulsions may occur even when the hæmorrhage is trifling. These symptoms cannot fail of exciting suspicions of inversion, which will be readily ascertained on examination; the womb protruding like a mass of flesh, and no uterine tumour being present in the hypogastrium.

77. (*b.*) *Causes.*—Inversion is produced by pulling the cord in endeavours to remove the placenta, which may even adhere when the uterus is pulled down; but it is generally separated; or it is caused by the sudden expulsion of the child, the cord being short or entangled about the child, the fundus receives a jerk, and is thereby inverted. Dr. BURNS thinks that great pressure or strong contraction of the abdominal muscles on the fundus uteri may cause depression of the fundus, in a cup form, and encroach on the uterine cavity. This may rectify itself, but it may increase and pass on to complete inversion some time after delivery. An incomplete inversion, as well as the complete, may become chronic, and occasion incurable fluor albus, and even hæmorrhage.

78. (*c.*) Inversion *terminates* in different ways: it may be rapidly fatal by hæmorrhage, or by syncope, or by convulsions; or it may be slowly fatal by inducing over-distension of the bladder, or inflammation, and various consequent changes. After severe pains and expulsive efforts, the patient may survive, or even partially recover, from the immediate injury; the uterus may slowly diminish to its natural size, become *chronic*, and cause little inconvenience; or it may discharge fœtid matter, and give rise to frequent debilitating hæmorrhages, with copious mucous discharge in the intervals; or hectic or pulmonary symptoms may come on, and the patient ultimately sink.

79. (*d.*) The *treatment* consists in reducing the inversion, if it be discovered sufficiently early. This is to be done by first pressing the uterus, if it have protruded without the vagina, within this passage. The tumour should be grasped cautiously in the hand; and, whilst it is compressed, the most prominent part of the fundus ought to be pushed up in the direction of the axis of the uterus. If reduction is accomplished, the hand should be kept within the uterus, so as to excite contractions, which will detach the placenta, if it still adhere. Even after the reduction, when the patient is apparently doing well, she may be seized with a fit, and die. But she generally remains long weak if she recover.

80. If inversion have not been early discovered, it is always much more difficult, and sometimes impossible, to reduce it. The obstacle is the contracted state of the os uteri. It may not admit of reduction, even after a few hours from its occurrence; and if it have become much more chronic, it is not prudent to make the attempt, as violent or dangerous convulsions may be produced thereby, and the uterus is often so swollen and inflamed as to render reduction impossible. The *chronic state of inversion* is considered under the head UTERUS, as it does not strictly belong to puerperal maladies.

ii. THE SPASMODIC AND NERVOUS AFFECTIONS OF THE PUERPERAL STATE.

CLASSIF.—II. CLASS. III. ORDER (*Author*).

81. The nervous and spasmodic diseases of puerperal females are *convulsions*, *mania* or *insanity*, *hysteralgia*, *paralysis*, and various irregular *spasmodic* and *nervous affections*, which seldom assume any precise or definite form. The first and second of these are considered in separate articles; the others will be briefly noticed at this place.

82. *A.* HYSTERALGIA.—(*a.*) This *painful affection of the uterus* occurs soon after delivery; but it is more continued and severe than the usual *after-pains* (which see). It is characterised by severe pain in the back and hypogastrium, by sickness, faintness, and a feeble, or sometimes quick pulse. These sensations may or may not be attended by the expulsion of coagula, or by a sense of severe bearing down. It not improbably is sometimes occasioned by some mal-position of the uterus consequent upon delivery. It is often connected with obstruction of the lochial discharge, which obstruction is probably caused by the painful affection of the uterus. Hysteralgia is most apt to occur after a severe or tedious labour. It may not appear until the third or fourth day, or when the patient has got up too early to have the bed made. It seems to be caused by an irregular spasmodic action of the muscular fibres of the organ, the spasmodic action and the altered sensibility sometimes extending also to the bowels.

83. (*b.*) The *symptoms* of hysteralgia vary with the extension of these morbid states to parts adjoining the womb and its appendages. The suddenness of the attack, the absence of rigors or chills; the greater severity of the pain than that attending inflammation; the suddenness of the remission or cessation of the pain, and generally the absence of tenderness or of increased suffering on pressure, chiefly serve to distinguish this affection from inflammation of the uterus.

84. (*c.*) The *treatment* consists of the administration of a purgative clyster with turpentine, castor oil, and camphor; and, after the bowels have been freely evacuated by these, or by a repetition of them, or by a draught containing half an ounce each of castor oil and turpentine, an opiate may be given, or may be administered in an enema. Terebinthinate fomentations or embrocations should also be applied, sufficiently warm, over the hypogastrium; and warm or camphoreted diaphoretics and opium, or henbane, may be given, to equalise the circulation and procure a free perspiration. Warm cloths soaked with oil of turpentine, and kept applied over the seat of pain, also will seldom fail of procuring relief. The abstraction of blood is rarely required, unless the affection be actually inflammatory, as evinced by increase of pain on slight pressure, by the states of the skin and urine, and by the pulse.

85. *B.* VARIOUS OTHER NERVOUS OR SPASMODIC AFFECTIONS sometimes appear in the puerperal state, especially in hysterical, delicate, or nervous females, and are evidently owing to the effects produced by uterine action and the vital shock upon the organic and cerebro-spinal nervous systems.—(*a.*) *Palpitations of the heart* are not infrequent soon after delivery in the temperaments just

mentioned, especially after considerable loss of blood, and upon any alarm. The patient experiences a violent beating not only at the præcordia, but also in the epigastrium and in the head, sometimes with dyspnœa, or short panting respiration. She is alarmed, apprehensive of dissolution, and her fears aggravate the symptoms. As the attack passes off, languor, depression, or a sense of sinking, or profuse perspiration, and flatulent distension usually supervene, and, after a time, the disorder subsides.

86. (*b.*) *Hysteria* is not uncommon, in some form or other. It may occur with dyspnœa, or with syncope, with hiccup, or with pains in the side or abdominal muscles, &c., and is generally aggravated, if not excited, by the secretion of air into the alimentary canal. The dyspnœa is seldom attended by cough, and is owing chiefly to exhausted power of the respiratory muscles, and sometimes to either too great or too little tightness of the abdominal bandage, the abdominal muscles and floating ribs being thereby too much compressed and embarrassed in the one case, or insufficiently supported in the other. When the *dyspnœa* is owing to an affection or *spasm of the diaphragm*, it is felt most on inspiration, and pain is often complained of in the back or sides, or pit of the stomach, with a feeling of suffocation, sharp pain sometimes darting across the lower part of the thorax, and with a very rapid weak pulse. This affection of the diaphragm usually occurs a few hours after delivery, and is always sudden in its accession and departure. It may readily be distinguished from pleurisy by these circumstances, and by the slower accession of pleurisy, which is usually accompanied with shivering or chills, and which very rarely or never appears so soon after delivery.

87. (*d.*) *Colic* may occur within a few days from delivery. It usually attacks suddenly, and in the evening; but it is not preceded by shivering, although it is sometimes attended by sickness or vomiting. The pulse is at first slow or natural, but it soon becomes frequent. The pain is remittent or intermittent, but commonly subsides altogether after some hours, when judiciously treated. If the irritating cause be not soon removed it may induce inflammation. *Cramp of the stomach*, or spasmodic gastrodynia may occur during the first fortnight or three weeks after delivery. Its attack is always sudden, the suffering extreme, and the danger great in delicate or exhausted females. It is often attended and aggravated by flatulence. It requires decided and prompt treatment.

88. (*c.*) Females who have been subject to the more obstinate and complicated forms of hysteria, and especially to *spinal irritation*, or to affections reflected from the spinal chord or roots of the spinal nerves, often experience various nervous disorders, either immediately after, or at more distant periods from delivery. Soon after the expulsion of the placenta they feel urgent *sinking* or debility, with a sensation and dread of flooding, although neither internal nor external hæmorrhage exists. In the more extreme cases, if stimuli be not administered, the patient may suddenly die, without any other obvious cause than the *sinking* or *exhaustion* consequent on the shock of parturition. These severe cases of sinking not only may affect the weak and delicate, or those weakened by flooding, or by greater losses of blood, than the state of the vascular system can well sustain; but sometimes even fat, plump, and apparently strong females may be placed in jeopardy by these attacks. In other instances, the sinking is followed by violent determinations of blood to the head, threatening phrenitis, or puerperal mania, or even passing into either, or into lethargy, coma, or apoplexy. Fat, plump, and pale females are even more liable than others to experience these dangerous forms of nervous sinking, owing to their deficiency of vital power and resistance, and the states of the blood and vascular system; and in them, nervous and vascular re-action are more rare.

89. (*d.*) Partial or even complete *paraplegia* sometimes occurs after delivery, although the labour may have been easy or natural. The head is unaffected, but pain or weight is felt in the back or loins, occasionally with retention of urine. The palsy exists in various degrees, but it generally disappears after a few weeks, when the treatment is judicious. A more severe and protracted form of partial paraplegia occasionally follows severe, protracted, or instrumental delivery. In these cases severe pain is complained of in the back and loins, with disordered secretion and excretion of urine. In most of these states of paraplegia there is either increased effusion of serum from the membranes of the spinal chord with congestion of these membranes and of the cord itself; or what is more probable, extreme congestion, also, of the venous sinuses external to the sheath, in the lumbar and dorsal regions of the spine. *Hemiplegia* is not more frequent in lying-in than in other females.

90. (*e.*) *The treatment of these several affections* is generally successful if it be prompt and efficient. —*a. Palpitations of the heart* (§ 85.) require the administration of antispasmodics with anodynes or narcotics—of Hoffmann's anodyne with small doses of opium or henbane; of the boracic acid with camphor and opium, or henbane; or with the ammoniated tincture of valerian, with either of these narcotics. When the paroxysm has been relieved by these, the antispasmodics should be conjoined with tonics and aperients, and change of air, preferably to the country or to the sea-side ought to be recommended.

91. *β. The hysterical affections* (§ 86.) are relieved by the remedies just now enumerated, more especially by the æthers, valerian, ammonia or camphor, and opium; and if dyspnœa be present, the state of the abdominal bandage should be examined and adjusted. If the symptoms be aggravated by flatulence, as they often are, ammonia or magnesia may be given with antispasmodic stimulants and warm terebinthinate embrocations, or epithems applied over the epigastrium. When the hysterical affection assumes a *colicky* form (§ 87.), from two to four drachms of oil of turpentine may be given with half an ounce of castor oil, and a drachm of tincture of senna, on the surface of an aromatic water; and the same remedies, in increased doses, administered as a clyster, if the bowels are not freely evacuated in six hours. After the evacuation of the bowels a full dose of opium, or of the compound soap pill will be given with benefit. If *flatulence* still continue, ammonia or magnesia, with gentle tonics, or the fœtid spirit of ammonia or the compound galbanum pill, may be pre-

scribed at intervals. If the colicky symptoms assume the form of *cramp of the stomach*, or severe *spasmodic gastrodynia*, the patient is placed in jeopardy, especially if it occur within a fortnight or three weeks from delivery. A draught containing a full or even a very large dose of laudanum, with camphor and æther, or with musk, or the compound spirit of ammonia, ought to be immediately given, and the warm terebinthinate embrocation, or a mustard poultice, be applied over the epigastrium.

92. *γ.* For those states of distressing *sinking* following parturition (§ 88.), Dr. BURNS advises about thirty drops of laudanum, and afterwards small doses of wine or brandy, or of compound spirit of ammonia, or ammoniated tincture of valerian, taking care not to give stimuli too freely, lest cerebral affection be thereby excited. Musk or camphor with opium is generally beneficial in these cases; and light nourishment ought not to be overlooked, as not a few of these cases arise from inanition, or the prolonged privation of requisite food and restoratives. If *phrenitic or maniacal symptoms* supervene, the treatment must depend upon the habit of body and strength of the patient. Vascular depletions, general or local, cold applications to the head, active purgatives, and terebinthinate enemata, external derivation and irritation, and the other measures advised for cases of *Puerperal Mania* (see INSANITY, PUERPERAL (§§ 55, *et seq.*) should be employed.

93. *δ.* The occurrence of *Paraplegia* in the puerperal state requires strict attention to the urinary functions and free purging, large doses of purgatives being sometimes necessary. Cupping or leeching near the spine may be requisite. Terebinthinate embrocations may also be applied in the course of the spine, and if these prove not of service, repeated blistering or open blisters may be directed, and the other means advised when treating of paraplegia (see art. PARALYSIS, §§215, *et seq.*) may be adopted. Three cases of this disease in the puerperal state have come before me, and have proved both obstinate, and afterwards associated with amenorrhœa. In one which had been of long standing, the amendment was slow. As soon as the patient is able to move the lower extremities, she should endeavour to use them as much as possible, and persist in the use of derivatives, both internal and external, of frictions, and of rubefacients.

III. THE MILDER FEVERS INCIDENTAL TO THE PUERPERAL STATE.

CLASSIF. — III. CLASS. II. ORDER (*Author.*)

i. EPHEMERAL FEVER — WEED — PUERPERAL EPHEMERA.

94. DEFIN. — *Chills or shiverings during early convalescence from parturition, followed by headach, pain in the back and limbs, thirst, rapid pulse, terminating with profuse perspiration and cessation of fever, generally in from twenty-four to forty-eight hours.*

95. *A. Causes.* — The increased sensibility, susceptibility, and irritability of puerperal females, give rise to febrile attacks upon exposure to comparatively slight causes, especially when the temperament is nervous or irritable, and the constitution is delicate. These states of *predisposition* are however much heightened by the changes in the vascular system, and in the blood itself, consequent upon pregnancy and parturition; and these, moreover, are associated with the predisposed conditions of the uterus, mammæ, and intestines, always present in these cases. The *exciting causes* are commonly exposure to cold, irregularities of diet, fatigue, exhaustion, want of rest, mental emotions, inattention to the state of the bowels and indigestion, getting up, or leaving the bed, or changing the apartment too soon; accumulations of morbid secretions and excretions in the biliary organs and bowels, &c.

96. *B. Symptoms.*—On the approach of the disease the patient is languid, yawns frequently, and experiences a sense of cold in the course of the spine, and extending over the body. The chilliness may increase to shivering, with, or followed by, headach, pain in the back and limbs; full, irregular, and rapid pulse, thirst, and slight diminution of the milk and lochia. The bowels are usually costive and flatulent, the stomach disturbed, the tongue coated, the patient is depressed in spirits; complains of shifting pains in the abdomen, is anxious or afraid of dying; and, in the more smart attacks, she is slightly delirious at night. The face is flushed, and she has pain in the breasts and in the forehead, with throbbing of the temples, and slight soreness of the abdomen. To these symptoms a copious perspiration succeeds, and removes the fever and its attendant symptoms, the milk and lochia returning to their previous states. The attack is usually *terminated* in about twenty-four or thirty-six hours; and if judiciously treated it seldom returns; but, if it be neglected, it may assume an intermittent, a remittent, or a continued form; or it may be complicated with some visceral disease, and assume a dangerous aspect.

97. *C. Diagnosis.* — The suddenness of the attack, the irregularity of the pulse, the absence of local pain excepting that of the head, and of abdominal tenderness, the rapid succession of the different stages, and the cessation of the paroxysm in a few hours, distinguish this state of fever from true puerperal fever, from which, however, it will be distinguished with difficulty during the early stage, if all the phenomena of the latter be not duly considered. (See hereafter, §§ 251, *et seq.*)

98. *D. Treatment.* — During the cold stage, warm diluents, warm flannels to the back, gentle restoratives, and external warmth are required. The states of the several functions should be carefully examined — the uterine discharge, the mammæ, and the abdominal secretions and excretions demanding the utmost attention. If the tongue be loaded, or if nausea be present, an ipecacuanha emetic should be given, and its operation promoted by warm diluents. If the bowels have been, and still are confined, a full dose of calomel, or of calomel and jalap should be taken. In all cases, the bowels ought to be freely evacuated by these or other purgatives, as the infusion of senna and salts, &c.; and, having hastened on the hot stage, saline diaphoretics, fewer bed-clothes, and diluents, should be directed, in order to procure a free perspiration, which may be kept up for five or six hours. As the perspiration declines, or at the end of that period, the patient should have her clothes changed; and gentle restoratives, especially such as may promote the secretions and excretions, ought to be prescribed, with a view of preventing a return of the attack and of restoring the tone of the system. From two to three grains of camphor,

with as much henbane, taken twice or thrice daily, and such restoratives and diet as the state of the patient will suggest, will prove beneficial. If the patient be exhausted by the attack, wine-whey, or wine and water warm, with sugar, &c. may be allowed; or the tonic infusions, or the infusion of valerian, or the decoction or infusion of cinchona may be given, with the solution of the acetate of ammonia, the ammonia being a little in excess, and the spirit of nitric æther may be prescribed. The abdominal excretions ought to be freely promoted by a combination of the compound infusions of senna and gentian, and any neutral salt, with tincture of cardamoms; and rest procured by a soothing dose of camphor (1 to 3 grs.) with opium or henbane, or with morphia. Change of air, especially to the sea-side, is always beneficial. The diet should be light and nutritious, as convalescence advances. The states of the mammæ and uterus should receive strict attention, and if either organ present prominent disorder, the treatment should be directed accordingly.

99. ii. Intestinal or Gastric Fever.—Febris Gastrica vel Intestinalis.—*F. Gastrica vel Intestinalis Puerperalis;—Puerperal gastro-intestinal Fever.*

Classif.—*Ut supra.*

100. Defin.—*After chilliness or shivering, fever, with nausea or vomiting, flatulence, griping, diarrhœa, and various nervous symptoms.*

101. *A.* This state of fever is generally *caused* by previous torpor of, and inattention to the bowels, by accumulations of bile in the biliary organs, and of morbid secretions and fæcal matters in the bowels, especially during the advanced period of gestation; by errors of diet after delivery; by close, low, damp, and cold apartments or situations; and by the use of acid, cold, or unsuitable drink or beverages. It usually appears within ten or twelve days from delivery, and is liable to be confounded with ephemeral fever at its commencement; and, when attended by inflation of the bowels, with the puerperal fevers.

102. *B. Symptoms.*—After chilliness or rigors, the patient is oppressed at the stomach, loathes food, and becomes sick. The pulse is frequent and soft; she complains of being cold, although the skin, except that of the feet or legs, feels from the first hot to another person. Afterwards, she is thirsty, has a slimy or white tongue, sometimes with red edges, and vomits a ropy mucus or bile. She now feels hot, especially in the hands and feet, is distressed with flatulence and griping pains in the abdomen, and the bowels are at first either open or costive, the stools dark and very offensive, and subsequently relaxed or even purged. Purgative medicines always act abundantly, and afford relief. The pulse continues quick; the patient does not sleep, or merely slumbers; and then she talks, or is tormented by visions and dreams. She often complains of short, darting, or nervous pains, or of throbbing or confusion in the head. There is no fixed pain in the abdomen or hypogastrium, nor any tumour in the belly, which is generally soft. The local discharge is not necessarily obstructed, nor is the secretion of milk affected, during several days; but, when diarrhœa is considerable, or continues, both one and the other are much diminished or suppressed. The countenance is unchanged at first, and continues so for some days, unless nervous symptoms, or pain in the hypogastrium, or some complication supervene. In some cases, when this disorder continues longer than six or seven days, and is neglected, inflation of the bowels, pain and tenderness in the lower part of the belly, pain on making water, or on passing the fæces, and other indications of irritation of the sexual organs supervene; whilst, in other cases, various nervous symptoms, as palpitation, vertigo, a feeling of sinking, or startings, and shooting pains in the head, are complained of. The *duration* of this fever, which is manifestly symptomatic of gastro-intestinal irritation, or consequent upon accumulation of morbid secretions in the biliary organs, and of fæcal matters in the bowels, is usually from a few days to a fortnight.

103. *C. The diagnosis.*—Intestinal fever may be distinguished from *ephemeral fever*, by not appearing so soon after delivery; by its more gradual accession, and by the manifest disorder of the stomach and bowels attending it; by the character of the evacuations and the griping or shifting pains in the abdomen; by the ready and copious action of purgatives, and the more protracted duration of the disease. It may be mistaken for either *puerperal fevers*, but the symptoms just enumerated, the relief obtained from purgatives, the softness of the abdomen, and the absence of fixed pain, of tension and of inflation, unless occasionally in very protracted cases, the state of the pulse, and the general condition and appearance of the patient will distinguish this complaint from the more serious fevers of the puerperal state.

104. *D. Treatment.*—An emetic of ipecacuanha is always serviceable on the accession of, or early in, this complaint. When its operation is over, saline diaphoretics and tepid diluents are then beneficial. A full dose of calomel may be given in a few hours after the emetic, and its operation on the bowels should be promoted by the administration of rhubarb and magnesia, or by a single dose of castor oil with spirit of turpentine. If the evacuations still continue offensive, with griping pains, either of these purgatives should be repeated; but if they be more natural, or if diarrhœa supervene, then the existing irritation ought to be allayed by opiate or anodyne enemata. The bowels should never be allowed to become costive; either of the purgatives just named, or the infusion of gentian and senna, being interposed, or given according to the requirements of the case. If griping pains or flatulence, or inflation of the bowels become troublesome, the application of the warm terebinthinate embrocation over the abdomen, and an enema containing spirit of turpentine, with olive oil and assafœtida, will afford complete relief.—The *diet* should depend upon the state of the bowels. If diarrhœa exist, light farinaceous articles of food, arrow-root, sago, and jelly, may be given. If there be no diarrhœa, ripe fruit may be allowed; and, as convalescence proceeds, the several farinaceous articles, various preparations of rice, beef-tea, warm jellies, chicken-broth, &c., may be taken. Ginger wine with water, Seltzer water with old Madeira or Amontiliado sherry, the milder tonics, as the infusion of columba or of cheyreitta, may also be prescribed as recovery proceeds.

105. iii. Miliary Fever—Febris Miliaris—Febris Miliaris Puerperalis.—The eruption described under the head, *miliary eruption*, some-

times occurs during the puerperal state, as a symptom of puerperal fevers. By several older writers, and by some as recently as the last century —by WHITE and others—it was described as one of the most formidable epidemics of child-bed; but it is now rarely met with, unless occasionally as a symptom of ephemeral fever, of milk fever, and of puerperal fever, when they are attended by profuse perspiration, and is evidently dependent upon a morbid state of the circulating fluids, consequent upon imperfect secretion and excretion, or upon the absorption of morbid matters, in connection with excessive secretion from the skin. It occurs most frequently in delicate females, and commonly from the fourth to the twelfth day from delivery. This eruption affords no crisis to the disease of which it is symptomatic, nor relief to the symptoms.—The *treatment* of this eruption, or rather of the disease of which it is a symptom, should be directed to the pathological conditions of that disease, as stated in the article "MILIARY ERUPTION."

IV. SEVERE PUERPERAL FEVERS.—SYNON.—*Puerperal Fevers.—Febris Puerperalis; Febris Puerperarum; Metritis Puerperarum*, Sagar, Sauvages;—*Hysteritis*, Vogel, Cullen;—*Metritis Puerperalis*, Boivin, Dugés;—*Peritonitis Puerperalis*, Forster, J. Clarke, Hull;—*Fièvre Puerperale*, Fr.;—*Kindbetterinn-fieber*, Germ.; —*The low fever of child-bed*, John Clarke;—*Child-bed fevers; severe child-bed fevers.*

CLASSIF.—III. CLASS. II. ORDER (*Author in Preface*).

106. DEFIN.—i. NOSOLOG.—*Great frequency of the pulse, and pain, tenderness, and tumefaction of the abdomen, occurring in the puerperal state; the pain often commencing in the pelvic region with rigors, the patient generally lying on her back, with the knees more or less elevated.*

107. ii. PATHOLOG.—*Fever occurring in the puerperal state; commencing, in some cases, in local disease, with rigors or chills; in other cases, from infection of the frame and contamination of the fluids, with or without chills or rigors, and frequently with, but sometimes without, prominent local lesion of structure.*

108. When treating of FEVERS in an early part of this work, I took occasion to point out the several and very different forms or types which the febrile diseases of the puerperal state assume (see FEVER, § 44.); and Dr. FERGUSON, in his classical work on "Puerperal Fever," has adduced the arrangement I then suggested, with others adopted by the more recent writers on puerperal diseases. It is evident, from what this able writer has stated, as well as from the best works which have been published on the subject, since the middle of the last century, but still more from an extensive experience of puerperal diseases, in different circumstances, seasons, and periods of their prevalence, that *puerperal fever* is not either a simple or an unvarying malady, and that, thus influenced, it assumes the most diverse types, forms, and complications, and often the most malignant and fatal character of any disease met with in European, or even in other countries. It is hence the more difficult to comprise within the succinct limits of a *definition* those characters which are applicable to all the states which puerperal fever may assume, without omitting what is really important, and, at the same time, embracing only such features as are essential to its actual and individual existence.

109. i. LITERARY NOTICES OF PUERPERAL FEVERS.—Previously to 1689 and 1733, when HAKE and BERGER wrote on the "Fevers of Puerperal Females," no satisfactory account of puerperal fevers existed, although inflammation of the womb after child-birth had been noticed by FELIX PLATER and TULPIUS; and the diseases incidental to this period had been viewed as consequences of errors in diet and regimen, and of interruptions or suppressions of the secretions and discharges, by SENNERTUS, RIVERIUS, WILLIS, DE LA BOE, MAURICEAU, STROTHER, BOERHAAVE, and others. The earliest accounts of puerperal fever as a distinct malady appeared in inaugural dissertations, published at some of the continental universities. These were probably of some importance at the times of their appearance, as containing much of the experience and views of the professors in these institutions respecting this malady, the earliest of these having been printed at Leyden, in 1689. In 1746, puerperal fever prevailed in Paris, chiefly at the Hotel Dieu, where scarcely any recovered from it, the albuminous exudations found in the peritoneal cavity appearing like to coagulated milk on the surface of the intestines, with a copious effusion of whey or milk-like serum; and hence the effusion was viewed as a metastasis of the milk, although a slight attention to the history of these cases would have shown that the secretion of milk was not suppressed, or even interrupted. (FONTAINE, COL DE VILLARS, &c., in *Hist. de l'Acad. Roy. des Sciences*, 1746, p. 16.)

110. POUTEAU (*Mélanges de Chirurg.* p. 180.) mentioned the appearance of this malady in the Hotel Dieu of Lyons in the spring of 1750, and its great fatality. He noticed sero-puriform effusion into the peritoneal cavity, thickening and contraction of the omentum, a relaxed and softened state of the uterus, and gaseous distension of the intestines, as the chief appearances on dissection; and was the first who regarded the disease as an epidemic erysipelatous inflammation of the peritoneum. Dr. HALL wrote an account of this fever in 1755; and SAUVAGES viewed it as inflammation of the uterus, occurring, 1st—in the puerperal state,—2d, associated with typhoid fever;—and, 3d, with suppression of the milk. STOERCK has stated that puerperal fever broke out in the hospital of St. Mark, at Vienna, in 1770, and prevailed through that city during the two following years. It was characterised by pain in the hypogastric region and abdominal swelling; the uterus presenting marks of inflammation and gangrene, and the intestines being covered by false membrane. Dr. DENMAN was the first author, after Dr. HALL in Edinburgh, who attempted in this country to give an account of this malady; but he appears not to have examined the body after death from this disease, although he more correctly infers that the milky matter, described by the French pathologists as existing in the peritoneum, is a product of inflammation. Dr. MANNING wrote soon after (in 1771), and ascribed the disease to a putrid tendency in the humours; and HULME, LEAKE, and WHITE, who followed him in quick succession, whilst they viewed the disease as inflammatory, and as affecting chiefly the pelvic viscera and peritoneum, believed that it could not be ascribed to simple inflammation, but to the in-

flammatory associated with a putrescent disposition; and MILLAR subsequently adopted the same view.

111. Next to POUTEAU, KIRKLAND espoused the most rational doctrine of the nature of this malady, on which he wrote in 1774, and considered it as arising from, and consisting of, sundry pathological changes;—from absorption of putrid or morbid matter from the uterus,—from inflammation of the womb,—from the retention and absorption of morbid secretions and excretions. He concludes that, whilst absorption of morbid matter, and inflammation originating in the uterus will occasion puerperal fever, the abdominal lesions will also be consequent upon the fever when occurring primarily. Whilst KIRKLAND thus wrote so creditably, this malady appeared in the Hotel Dieu of Paris, and prevailed during 1774 and 1775, but presented nothing of additional importance to what had already been ascertained. During the middle and towards the close of the eighteenth century, the disease was observed by numerous physicians, many of them of great reputation; but little was added to the existing knowledge of its nature and treatment, the fatality caused by it in hospitals being often so great as to harass the feelings of those who were called upon to combat it. More or less detailed accounts of the pathology and treatment of the malady appeared during this period in the writings of STOLL, BANO, BURSERIUS, BUTTER, HECKER, DE LA ROCHE, DOUBLET, FRANK, REIL, and others referred to in the *Bibliography*, but there is nothing furnished by them deserving especial notice.

112. In 1787 WALSH wrote on the disease, and considered it as an infectious fever complicated with diffuse inflammation of the peritoneum. In 1787 and 1788 this malady was prevalent in the General Lying-in Hospital in London, and an account of the appearances observed upon dissection was given by Dr. JOHN CLARKE in 1788 and 1793. In that manifestation of the disease, the peritoneum presented the chief morbid changes, and these he has described with greater precision than any of his predecessors. He remarked that the uterus and ovaria sometimes partook of the inflammation of the peritoneum, but not more frequently, nor more remarkably than other parts, and that the interior surface of the uterus was not inflamed. From this time, and guided by Dr. JOHN CLARKE's description of the changes after death, puerperal fever was viewed merely as *inflammation of the peritoneum in the puerperal state;* and this view was adopted by Dr. GORDON of Aberdeen, by Dr. JOSEPH CLARKE, of Dublin, by Dr. HALL, Mr. HEY, Dr. CAMPBELL, Dr. MACKINTOSH, and by Dr. ARMSTRONG, with but slight modifications, or with no further modification than the expressing of the same idea in somewhat different words—for in medical writings different words are too often substituted for different ideas. whose writers bring down the literature of puerperal fever in this country to 1822; their works deserving notice chiefly as furnishing examples of a particular form or epidemic state of the disease, without any recognition of other still more important states, observed by other authors, and insisted on by HAMILTON, BURNS, BOER, DOUGLAS, and others referred to in the sequel.

113. In 1823, I became consulting physician to Queen Charlotte's Lying-in Hospital, notorious at that time, and indeed for some years before and after that time, for the recurring appearances of this malady, in the most malignant forms, in its wards; and, for several years subsequently to 1823, I had numerous occasions of there observing the several states of puerperal disease. Contemporaneously with my own researches, and still more recently, investigations of a similar nature were made both on the Continent and in this country; and the results proved that inflammation of the peritoneum, in some form or state, although one of the most constant, is not the only, and often not the earliest change; and that alterations of the uterus, its sinuses, veins, and appendages, are equally common. POUTEAU had stated, about a century ago, that the inflammation of the peritoneum and pelvic viscera, in puerperal fever, is of an erysipelatous kind; and the same opinion was subsequently maintained by HUNTER, GORDON, and others, and still more recently by numerous writers. Indeed the erysipelatous or diffusive character of the inflammation when once the disease has commenced, could neither be overlooked nor disputed; for this character is, as I have shown when describing the causes of puerperal maladies (§§ 35—43. 130, *et seq.*), a necessary consequence of the operation of these causes, which, by their effects upon the states of organic nervous power and of the blood, preclude the formation, by the inflamed surface, of organizable or coagulable lymph, by aid of which the extension of the disease may be arrested.

114. It has been shown by KIRKLAND, and still more demonstratively by BANO, of Copenhagen,—a pathologist, whose clinical and necroscopic researches have not received their merited attention,—that not only the uterus, but also the ovaries and the Fallopian tubes, were inflamed, softened, or contained purulent collections; and that the womb often presented various changes in its internal surface. Similar lesions were afterwards described by JOHN CLARKE, SELLE, and OSIANDER; and more recently by numerous authors in Germany, France, and Great Britain. Inflammation of the uterine sinuses and veins was first distinctly described by BANO and J. CLARKE, and subsequently by DANCE, LUROTH, R. LEE, DUPLAY, TONNELLÉ, CUSACK, INGLEBY, the author, and others, and shown to exist, in many cases of puerperal fever, by several of these writers. Dr. JOHN CLARKE, however, in 1793, attempted to prove that the low, or the most malignant form of this malady is distinct from that which is attended by inflammation of the peritoneum, and of the uterus and its appendages; and although doubts have been expressed of the truth of this doctrine, still my experience has shown its accuracy; and has convinced me that a most rapidly fatal and most malignant form of puerperal fever is occasionally developed in lying-in hospitals, which is certainly not characterised by uterine phlebitis, nor by purulent collections in the uterus or its appendages, nor even in some cases by peritonitis, the chief lesions often being merely a remarkable alteration of the blood, general lacerability of the tissues or loss of their vital cohesion soon after death, with a dirty, muddy, offensive, and sometimes scanty serous effusion into the serous cavities. It is true that the circumstances by which this form of the disease is developed are seldom observed, and still more rarely at the pre-

sent day than formerly; but when once developed in these hospitals, under the circumstances in which I have observed it, not a single patient, within a week or fortnight from her delivery will escape this pestilence, which may even be propagated abroad to puerperal females, if the proper precautions be not taken. When I became consulting physician in 1823 to Queen Charlotte's Lying-in Hospital, the wards were small, crowded, and without ventilation — a large number of females being confined in each ward; and, as might have been anticipated *a priori*, a most pestilential form of puerperal fever was always recurring a few months after it was re-opened, after each occasion of its having been shut up for the purposes of fumigation and purification. In the fatal cases — and at first all the cases were fatal — the appearances now stated were those chiefly observed, in some instances with more marked disease of the peritoneum, and a relaxed or uncontracted state of the uterus. Subsequently, when the representations of the medical officers procured enlargement and better ventilation of the wards, with a diminution of the number of beds in a ward, puerperal fever was of rarer occurrence, and assumed different types and forms, with the progress of these sanitary alterations, inflammatory appearances in the uterus and appendages, in the uterine sinuses and veins, and in the peritoneum, being then most frequently observed in fatal cases. As I believe that, in the present and advancing state of medical science, and of sanitary improvement, the circumstances which have produced the more malignant forms of puerperal fever — the local pestilence, which I had to treat many years ago, are not likely to exist and to occasion a similar intensity of the disease, so I infer that the various states of inflammation of the uterus, of its appendages, of the uterine veins, and of the peritoneum, will constitute the chief lesions of puerperal fever; and that the type or character of the fever will entirely depend upon the state of inflammatory diathesis — upon the states of vital power and of the blood, accompanying the inflammation; and upon the absence or the presence of contamination of the circulating fluids by retained or absorbed morbid matters and excretions.

115. ii. ARRANGEMENT OF THE FORMS AND STATES OF PUERPERAL FEVER. — Numerous writers have described only one or other of the several forms or states of this fever, very probably from having seen only such form during a limited experience, and in peculiar circumstances, or from having described what they saw on a single occasion, or in a particular epidemic. That this has actually been the case is shown by the fact, that these authors have not described the same form or variety, but each has adduced the variety he has described as the true and only form of the disease, and has been indignant at those who believed that any other state of the malady can exist excepting that which he has observed. Thus ARMSTRONG, HEY, MACKINTOSH, CAMPBELL, &c., who observed chiefly inflammatory forms of the disease, accompanied with a sthenic diathesis, could not tolerate the idea that any other state of the malady existed, and were most ireful at J. CLARKE, HAMILTON, and others, who believed that a low, typhoid, or malignant form, very different from that which they described, sometimes broke out. Thus, from the days of STOLL and DOULCET, to almost the present time, some writers have described only a single variety, and have believed it only to be the true malady. But, as will appear more fully hereafter, the symptoms, characteristic features, and still more the *post mortem* appearances, display diverse features and extensive complications, according to the circumstances occasioning the disease and influencing its course.

116. Several writers, on the other hand, with stronger powers of observation, or with more extensive experience, have viewed puerperal fever as more or less varied in form, and complicated in its nature; and not from a single position or aspect merely, as those just alluded to, but according as diverse circumstances, seasons, or epidemic influences, have impressed on it different forms and complications. Thus JOHN CLARKE, having observed, — 1st. Inflammation of the uterus and ovaria; — 2d. Inflammation of the peritoneum; — 3d. Inflammation of the uterus, Fallopian tubes, or of the peritoneum, connected with inflammatory fever; — and 4th. Low fever, connected with affection of the abdomen, which is sometimes epidemic; — recognised three types or forms of puerperal fever; — 1st. That consisting of local inflammation in the puerperal state; — 2d. Primary inflammatory or synochal fever developing local inflammation; — and 3d. Typhoid fever with inflammation. — Professor VIGAROUS next divided the disease into — *a*. The gastro-bilious; — *b*. The putro-bilious; — *c*. The pituitous, proceeding chiefly from season, &c.; — *d*. The inflammatory, or associated with inflammation of the uterus, peritoneum, &c.; — *e*. and the sporadic, arising from mental causes, cold, &c. — M. GARDIEN arranged the forms of puerperal fever into the following: — 1st. The angiostenic, or strictly inflammatory; — 2d. The adeno-meningic, or slow insidious fever; — 3d. Meningo-gastric, with bilious derangement, yellow skin, &c.; — 4th. The adynamic; — 5th. The ataxic or nervous; — and 6th. Fever with local phlegmasiæ.

117. Several continental writers on puerperal diseases have confounded those which belong more essentially to the puerperal state with those which may occur under every contingency, which are quite unconnected with this state, and are not more likely to affect puerperal females than other persons; and they have thus embarrassed the subject with complicated sub divisions and compound terms. Thus BUSCH enumerates the following varieties in *the local affection*, occurring in the puerperal state: — (*a*.) Puerperal fever with inflammation within the abdomen; — (*b*.) With inflammation within the cranium; — (*c*.) With inflammation within the thorax; — (*d*.) With inflammation of the extremities; and he believes that the character of the fever may also be varied as follows: — 1st. Gastric fever; — 2d. Nervous fever; — 3d. Typhus fever; — and 4th. Petechial fever. RITGEN, like BUSCH, has rendered what is often a very complicated subject still more complicated and involved by his mode of discussing it. He views puerperal fever as a disturbance of the œconomy in its attempts to bring the organism back to the unimpregnated state; and he contends, that any organ in the three cavities of the body may become inflamed during this disturbance. He considers the term "*Malacosplanchnitis puerperalis*" as the best that can be applied to the malady, since not only may the peritoneum be

attacked, but any other viscus also, the chief peculiarity being the marked tendency of the local lesion to terminate in large fluid effusion.

118. Dr. ROBERT LEE, who has directed his attention to the state of the uterine vessels in puerperal fever, has referred the symptoms to *four varieties*; — 1st. To inflammation of the peritoneal covering of the uterus, and of the peritoneal sac; — 2d. To inflammation of the uterine appendages, viz. the ovaria, Fallopian tubes and broad ligaments; — 3d. To inflammation and softening of the proper or muscular tissue of the uterus; and, 4th. To inflammation and suppuration of the absorbents and veins of the uterus. It is manifest, however, that although cases will sometimes present one or other of these lesions, either singly or chiefly, much more frequently two or more of them will be associated in the same case; and, therefore, instead of founding the varieties upon the individual lesions, it would be preferable to consider the local lesions as complications, or prominent changes occurring in the course of the malady.

119. The arrangement adopted by some other recent writers have been much more simple; and have possessed this recommendation, although it may have been carried too far. MARTENS acknowledges only the *inflammatory* where one organ only is affected; the *nervous*, commencing with delirium; and the *putrid*, where the frame is more generally implicated. DOUGLAS has three forms, the *inflammatory*, the *gastro-bilious*, and the *epidemic*, or *contagious* or *typhoid*. TONNELLÉ assigns only three varieties, the *inflammatory*, the *adynamic*, and the *ataxic*. BLUNDELL adduces also three, the *sporadic*, the *mild epidemic*, and the *malignant epidemic*. This last physician believes that, in this last form, where the epidemical disposition to peritonitis is strong, the diffusion of the inflammation is great and rapid, whence the difficulty of the cure; that, in the milder epidemic, the peritonitic disposition is weaker, and the inflammation of smaller extent; and that, in the sporadic, the epidemic constitution is wanting altogether, and the local affection is limited and the treatment much more successful.

120. Dr. GOOCH, Madame BOIVIN, and M. DUGÈS have reduced the varieties to two—the *simple inflammatory form*, or metro-peritonitis, and the *typhoid*. In this last form, M. DUGÈS includes all cases of softening of the uterus and of suppuration of the veins; but he is certainly not accurate in his description of the symptoms characterising it.

121. The author, in 1834, adopted an arrangement of the *forms* or *states* of puerperal fever (see article FEVER, § 44.), which he had observed in practice, and which will be followed and illustrated in the sequel. In that arrangement, the local affection or affections were viewed as often being accidents or contingencies in the progress of the fever — as complications supervening in its course; whilst inflammations of the uterus and its appendages, and of the peritoneum, were admitted to be sometimes primary diseases, of which the fever was symptomatic. Dr. MOORE, in his very excellent treatise, published in 1836, very justly remarks, that the varieties observed in the local lesions in puerperal fever, arising under the same circumstances, cannot be viewed as forms or varieties of the disease, which may be known by the symptoms, but should be considered rather as complications appearing in its course.

122. Dr. FERGUSON, in his very able work on this malady, assigns as the result of his extensive experience *four* forms: — 1st. Puerperal fever characterised by abdominal pain; — 2d. Fever with gastro-enteric irritation; — 3d. Nervous form of fever; — and 4th. Complicated form of puerperal fever.

123. Dr. CHURCHILL, the most recent writer on puerperal fever, divides it, according to the predominant local affection, into *five varieties*, which he has placed in the order of frequency of occurrence: — 1st. Peritonitis; — 2d. Hysteritis; — 3d. Inflammation of the uterine appendages; — 4th. Uterine phlebitis; — 5th. Inflammation of the absorbents. This arrangement is open to the following objections: — (*a.*) It takes for granted that the lesions of these individual parts are truly and always inflammatory — are, in truth, inflammation seated in one or other of these structures, and the fever the symptomatic constitutional expression of the inflammation of such structure — positions which cannot be supported by enlightened observations: — (*b.*) It leaves without any recognition or mention the type or nature of the fever as a consequence or effect of the exciting causes, — it takes no account of the varying character of the constitutional disease, upon which, and upon it only, can rational and successful indications of cure be founded; — (*c.*) It takes for granted that these lesions are primary, although this is only occasionally the case; and fails of viewing them, as they are presented in practice, in various circumstances, and in different endemic and epidemic states of prevalence. It is based upon a partial or piece-meal consideration of the malady, and instead of being founded on a comprehensive and mature digest of constitutional and local changes, it assumes that the nature of the constitutional affection, as well as of the local lesion is always the same, the only difference being the part originally affected; and it remarkably fails in this distinction, inasmuch as the local changes are rarely limited to a single organ or tissue, but are generally extended to several, and even to many. When most strictly limited, the appropriation of symptoms, so as to mark the limitation, cannot be effected with either truth or accuracy.

124. The above divisions of the several forms of puerperal fever comprise those which appear most deserving of notice. The classification of these forms, adopted from the results of my experience, and published in 1834, and subsequently by Dr. FERGUSON in 1839, embrace, — 1st. The *inflammatory states* of puerperal fever, or *inflammation*, (*a.*) of the uterus, (*b.*) of the ovaria and tubes, (*c.*) of the peritoneum, (*d.*) of any two or all of them. 2d. *Synochoid Puerperal Fever*, complicated with inflammation, — α, of the peritoneum, β, of the uterine veins, γ, of the uterus and appendages. 3d. *Adynamic or malignant puerperal fever*, — *a*, simple; *b*, complicated with predominant alteration; α, of the blood; β, of the fluids and peritoneum; γ, of the fluids, serous surfaces, and soft solids generally; δ, of the uterus, or of the uterus and appendages; ϵ, of the internal surface of the uterine vessels, substance of the uterus, &c.—(*a.*) The *first form* comprises the *primary or idiopathic inflammations*, most liable to occur in the puerperal state, and which, commencing in either of the organs or structures here specified are attended by symptomatic fever,

characterised according to the diathesis, strength, and circumstances of the patient, and are limited, or more or less extended or associated, according to these and other influences and causes.—(*b.*) The *second form* embraces those cases of frequent occurrence, especially in lying-in hospitals, in which it is difficult to determine whether the fever, or the local affection is primary — or in which the local alterations rapidly follow the constitutional or febrile affection. In this form of the disease, the symptoms are much more asthenically inflammatory than in the first, more insidious at the commencement, and often referable to a local contamination or infection. It may prevail in lying-in hospitals, on certain occasions which admit not of precise description, and may be propagated by contagion. It is not infrequently connected with the prevalence of erysipelas. I have seen it in the wards of hospitals which have not been over-crowded or apparently ill-ventilated. —(*c.*) The *third form* is the most malignant, and in its most intense and pestilential states, is seen chiefly in lying-in hospitals or wards, when over-crowded and ill-ventilated. The whole frame appears infected from the commencement, and whatever local affections or lesions may exist are developed in the progress of the malady, such lesions merely presenting more prominent forms than those observed in other parts of the body. This form of puerperal fever is caused by the local or endemic infection of the ward — by respiring an infected atmosphere; the infection originating as stated above. The disease produced by it may terminate rapidly in death, without any tissue or viscus having presented a more prominent lesion than the rest of the body. The blood, however, always is more or less altered, and the tissues generally are very deficient in vital cohesion immediately after death. When this form of the malady is less rapidly fatal, one or more of the complications, or rather of the more prominent alterations enumerated above are generally observed.

125. Between the more primary inflammations, appearing sporadically, and constituting the *inflammatory form* of puerperal fever, and the *malignant form* now mentioned, that form which I have named the *synochoid* holds an intermediate place, passing insensibly into either of the other forms with the intensity of the exciting causes, and the amount of predisposition. This *synochoid*, or *intermediate form*, may arise not only from a less concentration of the causes—from a less impure or contaminated air—from a less concentrated or intense effluvium; but also from an impure or infected state of the bed or bed-clothes, or from the infected hands of the accoucheur, causing a local infection during examination; or from other circumstances either already, or about to be noticed; but according to the nature of the causes, their concentration, the state of the patient and the predisposition, so will it approach either the inflammatory form on the one hand or the malignant on the other; and so will it occur sporadically, or even extend by infection.

126. Another circumstance deserving a brief notice is the fact, which has been presented to me on several occasions, that, although the cases which occurred when ventilation was most deficient, were generally of the third or most malignant form I have mentioned, yet occasionally a less malignant case, or one more properly belonging to the second form, presented itself, and was to be ascribed to the greater constitutional powers of the patient. But during this state of ventilation and infection not one escaped the disease who was confined in the hospital. Subsequently, when ventilation was improved, and when a fever ward was provided outside the institution, the cases presented generally the second form, and very few of the most malignant or third form were then seen.

127. Besides these three forms of puerperal fever, with their complications or more prominent lesions, another may be adduced, namely, infectious, or *true typhus fever* occurring in the puerperal state; and of which I have seen a few instances. The infection may have been received before or after delivery; but typhus fever appearing in this state should no more be viewed as a form of puerperal fever than small-pox, or any other of the exanthematous fevers ought to be so considered, when attacking a woman in child-bed. I shall, therefore, notice it no further than the diagnosis may require.

128. In the several works which have appeared upon puerperal fever, the *epidemic* and the *sporadic* occurrences of its several forms have been mentioned in a very loose manner. I have no doubt of any of the forms of the malady appearing sporadically, more especially the first and second forms which I have assigned, when circumstances combine to develope them; nor can I deny that any of these forms, more particularly the second and third, may become so prevalent owing to a combination of causes, as to deserve the epithet epidemic. But most of the instances in which puerperal fever has become so prevalent as to be so called, have occurred in lying-in wards; and the disease has been limited to them, unless on some occasions when the infection has been carried abroad from them. The term epidemic is therefore not strictly applicable, the malady being truly *endemic* as respects such institutions as thus occasion it, the character, the type, intensity, and other features of the malady, depending much upon the *endemic sources* — upon the concentration of the infectious effluvia and other causes generated in these institutions and wards. It is not improbable, however, that certain atmospheric constitutions, depending upon the states of terrestrial and atmospheric electricity, and of humidity and temperature, and other circumstances affecting the prevalence of febrile maladies, may so affect also the form and prevalence of puerperal fever as to render it not only endemic in lying-in hospitals, but also epidemic, or approaching to this state, in various places, in which it may break out. For, as I stated above (§§ 36. 44. 138.), causes similar to, or almost identical with, those which generate it in lying-in wards, actually exist in various houses and localities, in such forms and degrees of concentration as to give rise to sporadic cases, which, when circumstances combine to favour their spread, may propagate the malady.

129. It will be asked, what are these causes which thus exist locally or endemically? — 1st. Beds and blankets contaminated by prolonged use, without any attempts at purification (§ 44.); — 2d. Privies containing immense accumulations of fæcal matters, often rising as high as the boards, emitting contaminating vapours, particularly when frequented, or disturbed, and sometimes occasion-

ally, as I have remarked in several instances, asthenic or irritative and spreading inflammation of the vulva, vagina, and cervix uteri of married females, and even also of the rectum. I am convinced that the domestic causes of disease, and even of the most malignant maladies, which I have described in the article PESTILENCES, PROTECTION FROM (§§ 10—23.), and of which I have even assigned proofs (§ 14.) at that place, are mainly concerned in producing the more serious forms of puerperal disease; the malignancy of the attack depending chiefly upon the concentration or intensity of the cause.

130. iii. CAUSES.—The *causes of puerperal diseases* have been stated above, with reference both to the peculiar condition of the puerperal female, or the predisposition thereby acquired (§§ 6, *et seq.*), and to the more efficient and immediate agents and influences (§§ 35, *et seq.*, and 129.). These a redisposing and exciting causes, with their several concomitants, especially when present in concentrated or intense forms, commonly occasion puerperal fevers — produce it sporadically and favour its spread. From the days of HIPPOCRATES, down to the close of the last century, the suppression of the lochia or of the milk was viewed as the chief cause of puerperal fevers; and certainly there can be no doubt that the suppression of these will often be followed by very serious disease, particularly of a febrile kind. But, in most instances, the suppression is merely one of the effects of antecedent causes; and it may not, — indeed, most frequently it does not — take place in the most malignant states of the disease.

131. *A.* The *predisposing causes* of puerperal diseases have been already enumerated, and the influence of mental emotions has been noticed. The depression caused by *fear* of the disease, especially in lying-in charities, when the death of a patient is known, has a remarkable effect in favouring the extension of the disaster, and the *depressing feelings* entertained by unmarried puerperal females exert a similar influence. Large *losses of blood*, by uterine hæmorrhage or otherwise, have a manifest influence, not only in predisposing to, but also in aggravating the danger of this disease, more especially in lying-in hospitals and wards. Several instances demonstrating the truth of this statement have been observed in the course of my experience. Hæmorrhage appears to increase the predisposition, both by augmenting vital depression and shock, and by favouring the absorption of morbid secretions and excretions, and the passage of contaminating effluvia into the circulation.

132. Hydrometric and thermometric states of the *atmosphere* also favour the occurrence of puerperal fever, both by depressing nervous power and by concentrating animal exhalations. Cold and humid states of the air frequently prevent due ventilation of wards and apartments, and the requisite dilution of the contaminated atmosphere; and all methods of warming lying-in apartments which do not promote due ventilation, or currents of fresh air, tend remarkably to generate a pestilential effluvia in lying-in wards or hospitals. *Humidity* at all seasons, but more especially during winter and spring, favours the generation and propagation of this and its allied diseases, as remarked by writers of all ages, more especially of erysipelas, fever, dysentery and rheumatism.

133. Some difference of opinion has existed respecting the seasons and states of the weather favouring the development of puerperal fever, especially in lying-in wards. My experience convinces me that *cold* is influential chiefly by preventing that amount of ventilation which is requisite when several women are in child-bed in the same apartment. According to my own observations, during a period of thirty years, the disease has been most prevalent during the last three months and the first four of the year. M. DUGÉS' observations, which are limited to 1819 and 1820 merely, show an order of frequency as follows: — November, February, January, October, December, September, May, March, April, August, July, June. M. DE LA ROCHE, of Geneva, exhibits the following order of prevalence: January, March, November, December, April, October, September, February, July, August, May, June. As respects the influence of humidity there is greater uncertainty. But I believe that a moist state of the air, especially when conjoined with a low temperature, is most injurious, especially as respects lying-in wards; and in this opinion I am supported by CHAUSSIER, DUGÉS, CLEIT, and others, whilst M. DE LA ROCHE considers that a dry state of the air is most favourable to the prevalence of the malady. Humid states of the atmosphere conjoined with warmth and stillness are certainly not infrequently productive of sporadic cases arising from the local sources of contamination and infection already pointed out (§§ 36, *et seq.*); and from these cases either contagion or infection may extend when the media are suitable to the transmission, especially by the midwife or nurse.

134. But neither temperature nor grades of humidity, nor both conjoined, always account for the prevalence or absence of this distemper. There seems to be a disposition to the prevalence of it at some periods and not at others, independently of the conditions now remarked upon. The states of the electricities, in as far as they affect the human body, may be the cause of this predisposition, or emanations from the soil, of a nature quite incognisable to our senses, and means of detection, may favour its development and diffusion. But the epidemic occurrence of the malady seems allied to the prevalence of low or adynamic or eruptive fevers, more especially of typhus and erysipelas; and when puerperal fever is found to prevail in lying-in hospitals, independently of crowding or want of due ventilation, it generally partakes of the nature of the prevailing epidemic, or of the general epidemic constitution.

135. Neglected states of the bowels, constipation, or diarrhœa; improper or insufficient food; addiction to the use of spirituous liquors or cordials, and living in low, ill-drained, and ill-ventilated houses, also predispose to puerperal fevers. It is difficult to determine the influence of first or subsequent labours, or of the kind of labour. But very quick labours have been viewed as favouring the occurrence of puerperal disease in those confined for the first time; and prolonged or difficult labours in subsequent confinements. Premature labour seems to dispose to puerperal fever; but it may be mentioned that, when the patient is infected by the disease previously to delivery, or to the full period of gestation, premature labour

will be thereby induced. Of this I saw two instances in consultation with medical friends in the winter of 1827 and 1828.

136. Other circumstances often concur with the foregoing in predisposing to puerperal fevers, more especially an age approaching to or above forty years; females who have suffered previous abortions, and who are vitally or mentally depressed or exhausted; severe, prolonged, or instrumental labours: those who have been subject to diarrhœa, hæmorrhoids, or leucorrhœa; and those who are cachectic, or have been ill-fed; or kept *too low* during their confinement. — Indeed, insufficient nourishment, or *inanition*, in the puerperal state, is a more frequent predisposing cause than usually believed. These require no remark, especially when they are concomitants of the foregoing causes, and with other states of predisposition noticed above. (See §§ 6. 10, *et seq.*)

137. *B.* The *exciting causes* are chiefly those which tend to contaminate the atmosphere of the lying-in apartment, or which may occasion a local infection.—(*a.*) The *sources* of contamination have been described above (§§ 35, *et seq.* 128, 129.); and although their nature and effects must have been long ago recognised, their removal and prevention have hitherto received very slight attention. But these are not the only sources. Many houses retain within their own walls, sufficient causes of contamination and of local infection, as just stated, and as fully demonstrated under the head PESTILENCES, PROTECTION FROM (§§ 10—23). These causes are often productive of dysentery and of asthenic inflammation of the vagina and uterus, and they may be inferred not to be less innocuous to females on the eve of delivery, the foul air evolved from these sources infecting the female organs, and thus producing sporadically, either some one of the forms of puerperal fever, or uterine diseases incidental to the puerperal state. That these maladies have been thus produced in several instances I have had sufficient evidence to prove; and that the more febrile or severe may be propagated to other females in this state, when circumstances combine to favour the propagation, I firmly believe. Besides these sources of *extrinsic* contamination, and the effluvia disengaged from foul beds (see § 44.) there are other influential causes which should not be overlooked, namely, direct and mediate contagion or infection, and the *intrinsic* contamination caused by morbid matters imbibed, and carried into the circulation from the uterus and vagina.

138. Not the least important of the exciting causes of sporadic cases, which, however, in circumstances favouring infection, may become more or less prevalent, is confinement in a low, close apartment, near where the exhalations from privies, cess-pools, or drains find an outlet and contaminate the air. Apartments near the ground floors of houses which are provided with privies and cess-pools that have no communication with drains and sewers, — and most houses are thus most injuriously constructed, — are liable to have the air in them contaminated at all seasons from these sources; but more especially in winter, when they are kept more closely shut, and when the exhalations arise not much less abundantly, and penetrate wherever hydrogenous exhalations may possibly pass.

139. The unguarded use of improper beverages, as beer, ale, wine, spirits, &c.; all sudden mental emotions, or shocks, frights, chagrin, anxieties, &c.; and premature excesses of any kind, may concur to induce an attack of certain forms of the disease, especially of the more inflammatory. Coagula in the womb, or retained in the vagina; portions of the placenta left adhering to the uterus; and death of the fœtus in utero, may severally cause uterine phlebitis, or other forms of this disease, especially if the labour has been tedious, or has required the use of instruments.

140. (*b.*) *The infectious nature* of puerperal fever has been denied by some, proved and believed in by many, and imperfectly elucidated, or stated without precision or due limitation by most recent writers on the disease. Infection, or even contagion is undoubted — unless by the inexperienced and the sceptical — in certain circumstances and forms of the malady. MM. TONNELLÉ and DUGÉS, however, do not believe in the contagious nature of puerperal fever, and adduce their experience at the Maternité in Paris in support of their opinion. During the latter part of 1818, and spring of 1819, the disease was extremely prevalent in Paris, where I was then residing, and had an opportunity of seeing some of the cases which were so numerous in that institution, where alone about three hundred women died of it in these two years. It was prevalent at that time not only in lying-in wards, but also throughout Paris and its environs. These physicians state that it did not extend itself to the bed nearest that in which a patient was affected by it; and they assert that women newly delivered there, had each a separate apartment, and yet were attacked. These are the chief facts in proof of their opinion, but they prove nothing beyond what has often been demonstrated (see §§ 143, *et seq.*), viz. that the malady is often propagated by the mediate contact of the hands of the midwife, and by the effluvium imbibed and conveyed by the clothes. They, however, admit, what was generally observed, both there and in other institutions, that when the fever was prevalent, it generally attacked several in the same ward, and was sometimes confined entirely to one ward, a fact sufficiently demonstrative of at least an infectious or contaminated state of the air or of the bedding in that ward.

141. A circumstance worth noticing is mentioned by M. DUGÉS, which is no mean proof of the influence of the infected air of the hospital upon the lower animals. During 1819 several cats frequenting the wards of the Maternité during the prevalence of fever, were attacked by painful distension of the abdomen, and tumefaction of the parts of generation. The most of them died in four or five days; and the dissection of them was made, in the presence of Professor CHAUSSIER, by M. DUGÉS, who found in the peritoneal and pleural cavities a large quantity of a whitish serum mixed with albuminous flocculi, and a thin whitish coating covering the abdominal and thoracic viscera. A similar instance of the cat of the hospital becoming infected occurred in the hospital to which I was consulting physician during the prevalence of the fever in it.

142. In 1824, I was requested by a practitioner in the Edgeware road to see a patient with him in this disease. She was the sixth case which he had had in the course of a few days. She was moribund when I saw her. I learnt from him

that each case of midwifery, which he had attended from the first of these six cases, was attacked in succession and had died; that he had called the most eminent accoucheurs to see these cases; that they had prescribed large bleedings; and that the present case had been also largely blooded, as was then the general practice, the injurious effects of which were making themselves apparent. I insisted that contagion had caused these cases, advised measures to be taken against his being the medium of its transmission, and no other cases occurred to him for a considerable time.

143. Dr. CAMPBELL wrote on this disease in 1822, from a short experience; and, because he saw no reason to satisfy himself of the propagation of it by contagion, contended, in opposition to the no mean authority and more extensive experience of HAMILTON and GORDON, that the disease was neither infectious nor contagious, although he has adduced no conclusive evidence that some at least of the numerous cases which occurred in 1822 did not arise from contagion. It must be admitted that the sources of sporadic contamination, which I have described above (§§ 137, 138.), are so abundant in Edinburgh, where Dr. CAMPBELL practised, that the difficulty of discriminating between the influence of these and of contagion is thereby much increased. With a candour, which always characterises the truly scientific inquirer, this physician states that subsequent experience has shown him his error (*Lond. Med. Gaz.* Dec. 1831), and much to his credit he adduces the following facts:—After examining the body of a female who died of the disease after an abortion, and carrying some of the diseased parts to the class-room, he attended the delivery of a woman the same evening without having changed his clothes: she died. Next morning he went in the same clothes to assist a difficult case, the subject of which also died of the disease; and of others who were seized, within a few days, three shared the same fate. In June 1823, he assisted at the dissection of a case, where, from want of accommodation, he was unable to wash his hands with due care. He was soon after called to two patients requiring assistance, and went without further ablution, and without changing his clothes, and both these were seized with the disease and died.

144. Dr. GORDON states that the malady attacked only those women who were attended by a physician or nurse who had previously attended those affected with it. He remarks that he had abundant proofs, that any person who had been with a patient in puerperal fever became charged with an atmosphere of contagion which infected every pregnant or puerperal woman who came within its sphere. Dr. HAMILTON affirms that this fever is produced by an infection *sui generis*, and that he is quite positive that this infection is of so virulent a nature that it may be conveyed by a third person. Dr. GOOCH records that a surgeon, after opening the body of a woman who died of this disease, continued to wear the same clothes, and delivered a lady a few days afterwards, who was attacked by a similar malady and died. Two more of his patients were seized in rapid succession and also died. He then suspected the transmission of the infection by his clothes, changed them, and met with no more cases of the distemper. A washer-woman and nurse washed the linen of a female who had died of puerperal fever. The next lying-in patient she nursed died of this disease, and so did a third; when the circumstance having become known, she was no longer employed. At SUNDERLAND, forty out of fifty of these cases occurred in the practice of one surgeon and his assistant. Many other proofs of infection have been adduced by Drs. LEE, MOORE, WALLER, ROBERTSON, and by many recent writers. The last named writer, in a most instructive communication (*Lond. Med. Gaz.* vol. ix. p. 503.), states, that a midwife in extensive practice among the out-patients of a lying-in charity, within one month delivered thirty cases living in an extensive suburb of Manchester, and of this number sixteen were attacked with puerperal fever, and they all died; and that, of about three hundred and eighty delivered at this time by the midwives of this charity, none had the disease except the patients delivered by this midwife. Other conclusive facts are adduced of contagion by this writer.

145. These facts sufficiently show the contagious nature of this disease—that this fever may be propagated both by the hands, and by the clothes, or by either, of a third person, that third person being generally the midwife or nurse. But not only is it thus contagious—the tangible communication often taking place during an examination *per vaginam;* but it is also infectious through the medium of the bed-clothes or bedding, or the body-clothes of a patient, or of a midwife or nurse, or the contaminated air of a lying-in ward. I have had several occasions of observing, that a lying-in hospital, or ward, for some time after having been opened or purified, will remain free from puerperal disease; but that, if too many patients be admitted, or if, owing to the season, weather, temperature and humidity, the wards are too closely shut, the emanations from the discharges, &c., will soon contaminate the air, and infect the more recently delivered women, the effluvium from those first attacked increasing the infectious state of the air, which is confined for a time to the wards where the emanations were first accumulated, but which soon becomes diffused through all the wards and apartments.

146. It has been very justly remarked by Dr. HOLMES, of Boston, United States, that, "suppose a few writers of authority can be found to profess a disbelief in contagion—and they are very few compared with those who think differently—is it quite clear that they formed their opinions on a view of all the facts, or is it apparent that they relied mostly on their own solitary experience?" Dr. DEWEES, in the last edition of his treatise on the diseases of females, has expressly said:—"In this country under no circumstance in which puerperal fever has hitherto appeared does it afford the slightest ground for the belief that it is contagious." The evidence already furnished may be viewed as quite decisive of the infectious and contagious nature of the disease in Europe; but Dr. DEWEES is incorrect as to his statement of the matter as respects the United States; for, as Dr. HOLMES has remarked, Dr. FRANCIS states, that the disease was in some instances supposed to be conveyed by the accoucheurs themselves; and Dr. PEIRSON, of Salem, United States, admits this to have occurred to himself in several consecutive cases. Dr. CONDIE, although not previously a

believer in the contagious nature of the malady, "has nevertheless become convinced by the facts that have fallen under his notice, that the puerperal fever now prevailing is capable of being conveyed by contagion."—(*Trans. of Coll. of Phys. of Philadelphia*, July, 1842.) Dr. WARRINGTON stated at the same meeting of the college, that after assisting at an autopsy of puerperal peritonitis, he was called upon to deliver three women in rapid succession. "All these women were attacked with different forms of what is commonly called puerperal fever." At this meeting also Dr. WEST stated, that seven females delivered by Dr. JACKSON in rapid succession were all attacked with puerperal fever, and five of them died. These were the only cases which occurred in that district; for the women became alarmed at the existence of what Dr. DEWEES and a few with him have denied, and sent for other assistance. "And here I may mention that this very Dr. S. JACKSON is one of Dr. DEWEES' authorities against contagion!"

147. A physician in Boston, United States, had the following consecutive cases: — on the 24th March, 9th, 10th, 11th, 27th, 28th April, and 8th May, seven in all, of which five died. He then left town. Another physician writes to Dr. HOLMES as follows: — "The first case was in February (1830), during a very cold time. She was confined the 4th and died the 12th. Between the 10th and 28th of this month I attended six women in labour, all of whom did well except the last, as also two who were confined March 1st and 5th. Mrs. E., confined February 28th, sickened and died March 8th. The next day, the 9th, I inspected the body, and the night after attended a lady, Mrs. G., who sickened and died the 16th. The 10th I attended another, Mrs. B., who sickened, but recovered. March 16th, I went from Mrs. B.'s room to attend a Mrs. H., who sickened and died 21st. The 17th I inspected Mrs. G. On the 19th I went directly from Mrs. H.'s room to attend another lady, Mrs. G., who also sickened and died 22d. While Mrs. B. was sick on the 15th, I went directly from her room, a few rods, and attended another woman who was not sick. Up to the 20th of the month I wore the same clothes. I now refused to attend any labour; and did not till April 21st, when, having thoroughly cleansed myself, I resumed my practice, and had no more puerperal fever. The cases were not confined to a narrow space. The two nearest were half a mile from each other, and half that distance from my residence. The others were from two to three miles apart. There were no other cases in their immediate vicinity." (p. 517.) In another communication, the writer considered that he carried the contagion to five cases; and both he and the preceding correspondent state that the disease infected the young and the more aged; the strong and the weak; and without being influenced by the labour or other circumstance.

148. Dr. RAMSBOTHAM remarks, that he has known the disease to spread through a particular district, or to be confined to the practice of a particular person, almost every patient being attacked by it, whilst other practitioners had not a single case; and he views the distemper as being capable of conveyance in not only common modes, but through the dress of the attendants on the patient. — (*Lond. Med. Gaz.* 2d May, 1835.) Dr. BLUNDELL says, that some practitioners "have lost ten, twelve, or a greater number of patients in scarcely broken succession:" that this fever may occur spontaneously he admits; that its infectious nature may be plausibly disputed he does not deny; but he would considerately add, that he had rather "that those he esteemed the most should be delivered, unaided, in a stable, by the manger-side, than that they should receive the best help, in the fairest apartment, but exposed to the vapours of this pitiless disease. Gossiping friends, wet nurses, monthly nurses, the practitioner himself, are the channels by which the infection is chiefly conveyed." — (*Lect. on Midwifery*, p. 395.) My friend Dr. KING, of Eltham, mentioned at a meeting of the Medical and Chirurgical Society (*Lancet*, 2d May, 1840), that some years since a surgeon at Woolwich lost sixteen patients from puerperal fever in the same year. He was compelled to give up practice for one or two years, his business being divided among the neighbouring practitioners. No case of the disease had occurred in the practice of these practitioners, or occurred afterwards. Mr. DAVIES states, that in the autumn of 1822 he met with twelve cases, while his medical friends in the neighbourhood did not meet with any, or at least with very few. He could attribute this to no other cause than his having been present at the examination of two cases, and his having conveyed the infection to his patients notwithstanding every precaution. In December, 1830, a midwife who had attended two fatal cases of puerperal fever at the British Lying-in Hospital, examined a patient who had just been admitted to ascertain if labour had commenced. This patient remained two days; but labour not coming on she returned home, when she was suddenly delivered before she could return to the hospital. On the third day she was seized with the fever, and died in thirty-six hours. A young surgeon shortly after examining the body of a sporadic case that had died, delivered three women who all died of puerperal fever. Mr. INGLEBY states, that two gentlemen after the post mortem examination of a case of this disease, went in the same dress, each respectively, to a case of midwifery. The one case was attacked in thirty hours afterwards, the other in three days. One of the same surgeons attended, in the same clothes, another female, and she was attacked on the evening of the fifth day, and afterwards died. These cases belonged to a series of seven, the first of which was believed to have originated in a case of erysipelas. Mr. INGLEBY also adduces another series of severe cases which occurred to a practitioner in 1836, the first of which was also attributed to his having opened erysipelatous abscesses shortly before.

149. Dr. RIDDY remarks, that the discharges from a patient in puerperal fever are highly contagious; that the puerperal abscesses are also contagious, and may be communicated to healthy lying-in women by using the same sponge, as proved repeatedly in the Vienna Hospital; and that the women engaged in washing the bed-linen of the General Lying-in Hospital have been attacked with abscesses in the hands and diffuse inflammation of the cellular tissue. Dr. RAMSBOTHAM, in a letter to me, mentions a series of seven cases, two of which he saw, which occurred successively to a surgeon in this city; and he,

moreover, notices the connection of erysipelas with certain of these cases; but to this I shall revert in the sequel. Now, after the evidence I have adduced—and I could have quadrupled the amount—is it not criminal for any medical man to go from a case of this disease, or even from a case of erysipelas, to a female in the parturient or puerperal state, without using the strictest precautions? I may conclude this part of my subject by stating that the fact of the contagious nature of this malady is completely set at rest by the above evidence, especially when it is undisputed that within the walls of lying-in hospitals a miasm is often generated as palpable to the senses, and even sometimes much more so, than the fumigations used to destroy it, so tenacious as often to withstand the common measures of purification, and when generated, more deadly than the plague, if not arrested at its commencement by the most prompt and efficient means. I may further add, that lying-in hospitals, or even lying-in wards, ought not to be allowed to exist, for the reasons rendered apparent by what I have adduced, and because the aid they afford may be more beneficially furnished in other ways; and that boards of health, if such existed, or without them, the medical institutions of a country should have the power of coercing, or of inflicting some kind of punishment on those who recklessly go from cases of puerperal fevers to parturient or puerperal females, without using due precaution; and who, having been shown the risk, criminally encounter it, and convey pestilence and death to the persons they are employed to aid in the most interesting and suffering period of female existence.

150. The contagious nature of puerperal fever has been denied by HULME, LEAKE, HULL, BEAUDELOCQUE, TONNELLÉ, DUGÈS, DEWEES, and others; but GORDON, J. CLARKE, DENMAN, BURNS, HAMILTON, HAIGHTON, BLUNDELL, GOOCH, RAMSBOTHAM, LOCOCK, DOUGLAS, LEE, INGLEBY, ALISON, RIGBY, WATSON, CHANNING, and others, have professed their belief in, or adduced proofs of, the existence of this property, as respects this, the most frightful of any of our domestic pestilences; and if any would prefer the weight of authority to the overwhelming evidence now adduced, the names I have enumerated must satisfy him—at least they are quite, nay, more than sufficient to warrant him in acting with caution, and to render him criminal in the eyes of the considerate part of the community if he should ever be the medium of transmitting contagion and death to those who confide not only in his science, but also in his humanity, and in the incalculable value attached by him to human life. Dr. HOLMES has forcibly and eloquently brought this much neglected subject before the profession; and he thus concludes:—"It is as a lesson, rather than as a reproach, that I call up the memory of those irreparable errors and wrongs. No tongue can tell the heart-breaking calamity they have caused; they have closed the eyes just opened upon a new world of love and happiness; they have cast the helplessness of infancy into the stranger's arms, or bequeathed it with less cruelty the death of its dying parent. There is no tone deep enough for regret, and no voice loud enough for warning. The woman about to become a mother, or with her new-born infant upon her bosom, should be the object of trembling care and sympathy wherever she bears her tender burden, or stretches her aching limbs. The very out-cast of the streets has pity upon her sister in degradation when the seal of promised maternity is impressed upon her. The remorseless vengeance of the law is arrested in its fall at a word which reveals this transient claim for mercy. The solemn prayer of the liturgy singles out her sorrows from the multiplied trials of life, to plead for her in the hour of peril. God forbid that any member of the profession, to whom she trusts her life, doubly precious at that eventful period, should hazard it negligently, unadvisedly, or selfishly!"

151. *C. What Connection is there between Puerperal Fevers and Erysipelas?*—The connection apparently existing between these diseases has been hinted at above; but it is more remarkable at some seasons and occasions than at others. It was first observed and insisted upon by POUTEAU in 1750, who considered the puerperal fever as it then prevailed in Paris as an epidemic erysipelas of the peritoneum. Drs. HOME and YOUNG of Edinburgh, and Dr. LOWDER of London, not long afterwards, also maintained this opinion. Dr. ABERCROMBIE, as Dr. MOORE has remarked, adopted a similar view, and founded his opinion principally on the circumstance of both diseases giving rise to serous effusion. In the various discussions this subject has given rise to, it has been contended by Dr. WHITING, Dr. WALLER, and others, that the identity of both these maladies is shown by the similarity of symptoms, and by the ill-success of remedies; they asserting that, like erysipelas, puerperal fever cannot be arrested, and that it is contagious. This last property has been shown to exist, and cannot now reasonably be doubted. But that puerperal fever may be arrested I have proved on numerous occasions; and I shall have occasion to describe the means by which its arrest may be accomplished. Phlebitis of the capillary veins not infrequently complicates erysipelas, and uterine phlebitis is a frequent complication of the second or more intermediate grades or states of puerperal fever. These phenomena evince a certain amount of alliance, but not identity. GORDON, HEY, ARMSTRONG, and others, contend for similarity, if not for identity. Dr. LEE states, that in 1829, when the fever broke out in the British Lying-in Hospital, three children died of erysipelas, and on examination after death the peritoneum in these infants was found extensively inflamed, and covered with a copious sero-purulent effusion. Three other cases are related as having occurred under similar circumstances; but it is admitted, that cases of infantile erysipelas repeatedly occurred when there were no cases of puerperal fever in the hospital. I find it remarked, in my notes of cases of this disease observed by me in Queen Charlotte's Lying-in Hospital, that the relation subsisting between puerperal fevers, whether of an inflammatory, or of a malignant or of an intermediate type, and erysipelas, especially of an epidemic form, has been evinced on several occasions, and during several periods, in which the former have prevailed. Instances of both diseases occurred in the winter and spring of 1823 and 1830, and of almost every intermediate year. But cases have also been observed of either malady without the other; and, whilst infantile erysipelas has occasionally been seen contemporaneously with the

appearance of puerperal fevers among the women, the former has not infrequently been met with, when the latter did not exist, either sporadically or endemically.

152. Dr. HOLMES notices, in his instructive memoir, that Dr. S. JACKSON went from a case of gangrenous erysipelas which he had been dressing to the first of the series of cases which took place in his practice; and that a Dr. C., who delivered seven women in succession, who were all seized with puerperal fever, had made, on the 19th of March, the autopsy of a man who died after a very short illness, from œdema of the leg and thigh followed by gangrene, and the first of these seven cases was delivered by him on the 20th, the following day. When making the autopsy on the 19th, Dr. C. wounded his hand, and was confined to his house, after delivering the first case on the 20th, until the 3d of April, and on April the 9th he attended the second case of fever. "Several cases of erysipelas occurred very soon afterwards in the house where the autopsy of the man just mentioned took place. There were also many cases of erysipelas in town at the time of the puerperal cases. The nurse who laid out the body of the third puerperal patient was taken on the evening of the same day with sore throat and erysipelas, and died in ten days. The nurse who laid out the body of the fourth case of puerperal fever was seized on the day following with symptoms like those of that case, and died in a week, without any external marks of erysipelas.

153. Another physician, who had a series of five successive cases of puerperal fever, states, in a letter to Dr. HOLMES, that for two weeks previously to the first case of puerperal fever he had been attending a severe case of erysipelas, and the infection may have been conveyed through him to the patient, as he admits; but, he asks, "Wherefore does not this occur to other physicians, or to himself at other times; for he has since had a still more inveterate case of erysipelas, but he has had no disease in any of his midwifery cases?" It would be culpable in him to make the experiment, or to repeat the risk, without due precautions. Inoculation with the matter of small-pox or cow-pox does not always communicate the disease; indeed, it often fails of doing so; but no one now disputes the contagious nature of the virus inoculated. Dr. MERRIMAN, an able and cautious practitioner, mentioned (*Lancet*, 2d May, 1840) that he was at the examination of a case of puerperal fever at 2 P.M. *He took care not to touch the body*. At 9 o'clock the same evening he attended a woman in labour; she was so nearly delivered that he had scarcely any thing to do. The next morning she had rigors, and died in forty-eight hours. Her infant had erysipelas, and died in two days. A patient whom I was attending in the hospital, in 1828, was seen by a lady; and, whilst listening to her faint voice, her breath was felt by the lady, who was stooping over her. This lady was the following day attacked with erysipelas in the face.

154. Dr. RIGBY states that, in one epidemic in the General Lying-in Hospital, the child of every woman who died of the disease perished of erysipelas, which ran its course in a few hours. Dr. RAMSBOTHAM remarks, respecting this topic, that the cases recorded by CEELY and INGLEBY are so strongly in point, as to render it almost impossible to withhold the conviction that there is a form of fever to which puerperal women are liable, not only arising from the contagion of erysipelas, but, in its turn, also occasioning that disease in other persons. Whether in this affection, when it arises under such circumstances, the peritoneum is always attacked, is a question which he believes may be answered affirmatively in the great majority of cases. He further states, that on three occasions he has known the women who have nursed patients that died of this fever attacked with erysipelas of the leg; that in 1841, when erysipelas was prevalent in Rotherhithe, a medical friend of his had six cases, and whilst attending these he delivered a lady, who was speedily seized with puerperal fever, and very soon afterwards died. Her nurse was attacked with erysipelas of the hand, and was attended by another surgeon. One day, after having made an incision, and dressed the wound, this latter surgeon was called to a case of midwifery: puerperal fever supervened, and the patient sunk very rapidly. A third fatal case, attended by the same practitioner, Dr. R. also saw, and others that did well. The disease disappeared in that vicinity when these practitioners declined to attend women in labour. Since the appearance of the second edition of his work, Dr. R. has met with additional facts, which he has had the kindness to communicate to me. A surgeon, in Clerkenwell, had five fatal cases of puerperal peritonitis, rapidly following each other, and two others, which Dr. R. saw, and both recovered; but both the children of these two latter cases died of erysipelas. One of the nurses in these last cases also took erysipelas. When this surgeon attended the first case of puerperal fever, he was just recovering of an attack of diffuse inflammation of the cellular tissue, with abscess of the fore-arm, consequent on having pricked his finger in opening the body of a woman who died of cancer of the uterus. Dr. R. concludes with believing, that "the connection between malignant puerperal fever — that is, the fever in which the peritoneum is the seat of disease, and which terminates in the rapid effusion of soft lymph and whey-like serum into the cavity — and erysipelas is perfectly established." I may add to the above my opinion that the evidence is altogether satisfactory; that some of the series of cases of the more malignant states of puerperal fever have been produced by an infection originating in the effluvia proceeding from erysipelas, or by the contagion of the matter or contaminating material produced by erysipelas. It is quite unnecessary for me to adduce further facts in support of this inference, but they may be found in the writings of CEELY, ACKERLEY, RIGBY, S. JACKSON, HOLMES, INGLEBY, PALEY, STORRS, NUNNELEY, and numerous others, referred to in the BIBLIOGRAPHY to this article. My opportunities of observing this disease since 1812, and what I have seen of it in hospitals and in private practice, have convinced me of the propriety of the following *inferences* and *precautions*.

155. *a*. That lying-in hospitals and wards have been established and supported on mistaken views as to the benefits they confer on individuals and the community; that the charity would be bestowed more safely to the objects themselves, and to others contingently, if it were so administered as to afford the required aid, to increase the com-

forts, and to improve the sanitary conditions of females in the puerperal states at their own places of residence.

156. *b.* If these institutions be still continued and supported, as introductions to midwifery practice, or for the doubtful benefit of the recipients of a certain kind of charity, the obstetric physicians and surgeons attached to them ought not to attend those cases of puerperal fever or of erysipelas which so frequently break out in the wards of such institutions; for, by doing so, they convey the poison from one patient to another, both within and without the institution. In all such circumstances, the consulting physician or surgeon to the institution, who, as in my own case, should not be engaged in the practice of midwifery, ought to take charge of these cases, which should, immediately upon their attack, be removed, with due care and precaution, into a separate ward, provided for the reception of such cases, and situated without the walls of the hospital, but apart from other houses.

157. *c.* A physician or surgeon engaged in obstetric practice, upon the occurrence of puerperal fever in any of his cases, should either explain the matter to her friends, and call in a physician not engaged in this practice, to whose care she ought to be committed; or he should relinquish the care of puerperal females during his attendance on cases of this fever, and even of erysipelas; or he should change all his clothes, and carefully wash his hands, after seeing cases of either of these maladies, before proceeding to a puerperal female.

158. *d.* An obstetric practitioner should not make an autopsy of a case of puerperal fever, or of erysipelas, or of peritonitis, or of diffusive inflammation of the cellular tissue, or of the disease occasioned by the necroscopic poison (see *art.* POISONS, §§ 487, *et seq.*), nor even attend, or dress, or visit any of such cases, without immediately afterwards observing the precautions just stated, and allowing two or three days to elapse between such attendance and midwifery engagements, or visits to puerperal females.

159. *e.* It is the duty of obstetric practitioners attached to public institutions to prevent, as far as possible, the spread of this pestilence by midwives, nurses, or other assistants; and, as soon as two or three cases occur in succession, or other causes of suspicion present themselves, to take the most decided measures against the extension of contagion. Whatever indulgence may have heretofore been extended to those who have been the ignorant causes of the misery disclosed by the above statements — which convey but a small part of what has occurred in recent times — cannot now be expected, and ought not to be granted; for the practitioner is now too well informed, or, at least, the sources of information as to this matter are too open for him to be longer ignorant, that this most deadly of our domestic pestilences is conveyed from the infected to the healthy chiefly and most frequently by the accoucheur, when it occurs without the walls of a lying-in hospital; and that ignorance of, or inattention to, this fact, already not unknown to the well-informed part of the community, — this flagrant neglect of what we owe to those who confide in us, and to society in general, to whom we must look for consideration and esteem, — will be no longer viewed as a *misfortune*, but will be more justly considered a *crime*, of no small magnitude.

160. *D. What connexion is there between puerperal fever and other maladies, especially such as are epidemic or endemic; and may atmospheric vicissitudes or conditions be viewed as concerned in this connexion, and in their prevalence severally or collectively?* The *infectious nature* of puerperal fever has been demonstrated above (§§ 140, *et seq.*), and it has been shown, as in Dr. MERRIMAN's case, that the disease may be communicated without contact, although there is also reason to believe that the contact of a *materia morbi* will also convey it. The *connexion* between this fever and *erysipelas*, also a contagious disease, has next been shown (§§ 151, *et seq.*); and it has been proved that the effluvium from a case of puerperal fever will produce erysipelas in a person predisposed to this latter malady, whilst that evolved from a case of erysipelas will occasion puerperal fever in newly delivered females. Moreover, it has been shown, by several cases in the course of my practice (to two of which I was called by one practitioner, in the winter of 1827–28), that the infection of either this fever or erysipelas may be transmitted to females who are pregnant, more especially at a far advanced period of gestation, and may rapidly produce premature delivery, followed by all the characteristic phenomena of malignant puerperal fever; whilst, on the other hand, abortion or premature delivery, particularly when either is accompanied with great hæmorrhage or flooding, predisposes remarkably to the infection of puerperal fever, as well as to that of erysipelas.

161. The prevalence of *typhoid* or *adynamic fevers* have been considered by some writers as more or less connected with the occurrence of puerperal fever; and, indeed, that this latter is merely typhoid fever modified or aggravated by the puerperal state. We find that *small-pox* and *scarlet fever*, or *measles*, are remarkably aggravated, and the danger from them greatly increased, when they attack a puerperal female. But these diseases always preserve their identity and their specific forms, and the power of perpetuating or extending themselves. Their characters are not lost in those of puerperal fever; and if, during their course, the phenomena or the internal lesions and complications usually observed in malignant puerperal fever appear also in them, they are merely superadded, and become the causes of the greater malignancy and more rapid progress of the malady to a fatal issue. Now, this has been the case also with the *true* or *exanthematic typhus*, when it affects a puerperal female, as far as my observation enables me to judge; for the characteristic eruption and the low muttering delirium — the typhomania — marking this fever, have also appeared in the puerperal manifestation or complication of it, the features of the puerperal malady being also present; the puerperal state imparting to this specific fever, as it does to the exanthemata, dangerous complications, more malignant characters, and a much more rapid and unfavourable issue.

162. I have had reason, however, to believe, that puerperal fever may arise sporadically from the same causes as that form of fever which I have denominated *putro-adynamic*, — the *putrid fever* of the older writers (see *art.* FEVER, § 484.); — that fever, varying in its subordinate features, and in the

lesions supervening in its course, may be produced in the puerperal state by the same causes as those which occasion that form of continued fever; — that animal exhalations, the foul vapours from putrid animal matter and burying-grounds, the effluvia from privies and sewers, and the infectious emanations yielded by those affected by this fever, will produce puerperal fever, in all respects the same as when it prevails in lying-in hospitals; and that the puerperal fever thus originating may be spread in the manner above demonstrated: that, in short, malignant puerperal fever may arise sporadically from those sources of *infection* I have described when treating of this property (see INFECTION, §§ 11, *et seq.*), and of the causes of *putro-adynamic fever* (see FEVER, §§ 449, *et seq.* 484.), and be transmitted from one puerperal female to another, when the circumstances favouring this transmission are present.

163. Dr. COLLINS states, that puerperal fever has become epidemic in the Dublin Lying-in Hospital on several occasions when typhus fever prevailed in that city; and at other periods when erysipelas was frequent. A patient was admitted at a late hour labouring under fever with petechial spots over the body. She was removed to a separate apartment, and died soon afterwards. The two females who occupied the beds adjoining her's were attacked with puerperal fever and died. A patient in fever was admitted at night into one of the labour wards, where she remained for some hours. This ward contained four beds. The three women occupying the other beds were attacked with puerperal fever, and two died. Dr. COLLINS adds, that the recovery of the patient attacked with typhus fever at the *full period* of pregnancy is an interesting fact, as he believes that no complication proves more generally fatal than the premature expulsion of the child under such circumstances.

164. The prevalence also of the low types of the exanthemata, of rheumatism, and even of other diseases, which are favoured more or less by humid, stagnant, and cold states of the atmosphere, may exist contemporaneously with that of puerperal fever; but, in such circumstances, the only connexion subsisting between them is to be ascribed to the atmospheric conditions, especially those just stated, probably also associated with certain electrical conditions of the earth's surface and of the air, and with emanations from the various sources of impurity and of infection, with which all crowded localities, towns, cities, factories, &c., abound more or less, particularly when these emanations are not swept away by high winds and due ventilation.

165. iv. DESCRIPTION.—*Puerperal Fevers* present certain *types* or *forms*, depending chiefly upon the following circumstances: — 1st. Upon the intensity or concentration of the exciting causes, relatively to the predisposition of those exposed to their operation; — 2d. Upon the degree of depression of organic nervous energy or powers of life produced by those causes; — 3d. Upon the extent of contamination of the circulating fluids consequent either on the respiration of a foul or infected atmosphere, or on the absorption of morbid matters from the sexual organs, or from other parts; — 4th. Upon the continued operations of these, or of various concurrent causes and influences, during the progress of the malady; — 5th. Upon the states of season, weather, and epidemic constitution, at the time cases of this malady occur; — and 6th. Upon the manner in which the infection is produced, and the media or channels by which it is conveyed, when the disease is propagated by infection or contagion, as shown above (§§ 140, *et seq.*). These circumstances, aided by constitutional peculiarities, the previous conditions of organs and functions, and the morbid tendencies of the patient, are also the chief causes of the complications, ultimate changes, and results observed in the advanced course and at the termination of the malady.

166. The various arrangements of the forms of puerperal fever adopted by medical writers have involved the following important questions, namely,—(*a.*) *Are the several forms or types of puerperal fever the consequences of local changes—of those lesions observed after death; or, in other words, are they merely symptomatic disturbances of the constitution produced by these lesions?* — (*b.*) *Are the structural lesions or prominent changes found on dissection produced in the course of the malady, and are they the ultimate results of that malady?* — (*c.*) *And are these forms or types different from their commencement, and the effects of different grades of intensity of the exciting causes, and of the different avenues or channels by which these causes invade and poison the frame?*—Now the solution of these important questions has been eschewed by all writers, and even by the obstetrical writers, on this malady, many of whom have mystified, rather than enlightened the subject. The answers which may be given to these questions will appear more illustratively in the sequel, for the importance of the topics to which they refer is great, not merely as respects an accurate description of the different resulting forms and states, but also as regards the adoption of appropriate prophylactic measures and rational indications of cure. The discussion of this topic cannot, therefore, be neglected with propriety. It is necessary first to advert to the modes and avenues by which the poison or infection may contaminate the frame, as above demonstrated. (§§ 143, *et seq.*)—1st. The atmosphere of a ward may be infected by animal effluvia — by exhalations from decomposed discharges, &c., as there shown: or a puerperal female may inspire the poisonous effluvium absorbed, retained, and afterwards given out, by the clothes of the medical attendant or nurse. In these cases the frame is infected through the respiratory avenue; organic nervous power, and the circulating fluids being thereby morbidly impressed or affected. Whatever local changes, or prominent lesions are observed after death, whether implicating the peritoneum, or the sexual organs, or other parts, are, in such cases, *consecutive* of the operation of the exciting cause upon the nervous and vascular systems, and upon the blood. In these there can be no doubt as to the local lesions being consecutive of the infection thus produced; although the mode in which the consecutive lesions or complications are developed may admit of discussion as noticed hereafter (§§ 245, *et seq.*).

167. 2d. It has been showen above (§§ 137, *et seq.*) that the poison may be conveyed to the uterus or vagina by contact,— by the hands of the accoucheur; or the poisonous miasms or vapours exhaled from foul privies frequented just before

puerperalis. — *Inflammatory puerperal fever often commences in the uterus*, the substance of the organ being affected, about the third or fourth day after delivery, but often much later: — it may arise from prolonged, difficult, or instrumental labour; from cold or damp; from stimulants or heating food; and from other predisposing and exciting causes already noticed. *a.* The *symptoms* vary much with the severity of the attack, and with the extension of the inflammatory action to the uterine peritoneum on the one hand, and to the ovaria and ligaments on the other. It thus assumes mild or severe forms, the progress of which is modified by the rapidity of the extension just mentioned. The *milder states of hysteritis* usually commence from the fourth to the ninth day, and much resemble the ephemeral fever. The patient is chilly or shivers, is sick, and sometimes vomits. The pulse is frequent and soft; and with the establishment of re-action, pains, which were occasionally felt in the hypogastrium, and which were, perhaps, only considered to be after-pains, become more constant, but are not severe. They are usually felt behind the pubis; but they may extend a little to either side, or towards the groin. Pain is also sometimes felt in the back, especially if the patient attempts to sit up. It may not be complained of even in the hypogastrium, when she lies still; but it is usually felt when turning to either side, or when pressure is made above the pelvis. There is no fulness, hardness, or tenderness of the abdomen. The lochial discharge gradually diminishes; but it does not necessarily stop; and the milk sometimes continues plentiful. The skin is hot; there are more or less thirst, no appetite, sickness at stomach, and disturbed sleep. The pulse varies from 90 to 110; the head is confused rather than painful; the urine is high-coloured; the bowels confined; and wandering pains are felt in the belly and sides. The bowels afterwards become loose or irregular, the stools being dark, offensive, or morbid. Strangury, frequent calls to pass the urine, pains in the hips, and bearings down on micturition are often complained of. In the course of a few days, sometimes not until ten, twelve or fourteen days have elapsed, the pulse becomes slower, the appetite returns, the painful symptoms referred to the uterine region subside, occasionally a slight discharge takes place from the womb, and the disease entirely disappears. Sometimes, however, the patient continues to experience more or less disorder referable to the uterus, with or without slight alterations of the position of the organ, until the menstrual discharge is fully established, when it subsides.

177. *b.* The more *severe form of hysteritis* is often caused by difficult parturition, by rude management, or by other more intense causes. It usually commences between the second and fifth day, but it may appear at a later period. It is ushered in by chills or rigors, which are often present although the skin is hot, and which are generally preceded by pain in the lower part of the abdomen. With the appearance of re-action, and of the febrile symptoms the pain becomes more constant and severe, but is usually characterised by exacerbations. The uterine region is very painful on pressure just above the pubis, and in this situation there is generally some swelling, which, however, does not extend further until the peritoneum is affected. The abdominal parietes is slack or soft, so as to admit of the state of the fundus of the uterus being ascertained. The uterus is larger, harder, and much more sensible than usual. The pain extends to the back, shoots to the groins and hips, is attended by a sense of weight, and by difficulty of passing the urine. Occasionally there is distressing strangury, or complete suppression of urine. The lochial discharge is early suppressed, and the secretion of milk diminished or arrested. The temperature of the vagina is increased, and the sexual and urinary organs feel generally hot, inflamed, painful, and tender, the situation of the pain at the commencement varying with the part in which the inflammation originates. With the development of the local malady the symptomatic phenomena become prominent and severe. The pulse is very frequent, somewhat hard, or sharp; the skin is hot; thirst is increased; the tongue is white or dry; the urine high-coloured and scanty, or turbid: the bowels are at first confined, but afterwards lax or irregular; headach is present; the countenance expresses suffering, but it is not collapsed or constricted as in peritonitis; and nausea and vomiting are urgent. Sometimes the internal surface, or part of the womb, is chiefly or only affected; and, in this case, a puriform discharge follows the diminution or suppression of the lochia.

178. *c.* If the inflammation do not extend over the peritoneum, a *favourable issue* is more likely to take place than in any other form of puerperal fever. This *termination* often is preceded by a copious perspiration, by diarrhœa, or by uterine hæmorrhage, which is the most complete crisis. The abatement of pain and of the febrile symptoms; diminished frequency of the pulse; the reappearance of the lochia and of the milk; a free and general perspiration; a more natural state and excretion of urine; cessation of nausea and vomiting, and a more natural state of the bowels, are the surest signs of a favourable result.

179. *d.* An *unfavourable termination* of this form of the disease is to be feared when the inflammation extends either to the peritoneum or to the uterine appendages, or when it goes on to suppuration, either of the substance or sinuses of the organ. — *α.* If it extend to the *peritoneum*, the local symptoms, especially the pain and tenderness in the hypogastrium, advance upwards, and gradually invade all the abdomen, or sometimes only the lower regions; and swelling, tension, and tenderness of the belly with all the symptoms of *peritonitis* (§§ 172, 173.), supervene, and *complicate* the metritis. — *β.* If this latter go on to *suppuration*, the pulse becomes still more frequent, fuller, softer, and afterwards weaker, or more compressible, and smaller. The tongue is red or dry; the pain does not materially abate, but it becomes throbbing; chills or shiverings are sometimes experienced; and in the absence, or consecutive of these, copious sweats break out at intervals. The face is paler, or is more sharp than before, and occasionally a circumscribed hectic flush appears in the cheeks. The urine now deposits a pink sediment. The nights are sleepless, and, if the patient slumbers towards morning, she awakens in a profuse sweat. This suppurative form of hysteritis may prove early fatal; the pulse increasing in frequency, the tongue being red, and raw, and the strength sinking; or the hectic symptoms may

continue for weeks, and at last be fatal. Occasionally matter is discharged from the vagina, or by the bladder or rectum—oftener by the rectum. When it passes by the vagina the patient may recover; but when it passes by the other channels recovery more rarely occurs. It may break into the peritoneal cavity and produce fatal peritonitis. — γ. When metritis becomes associated with inflammation of the *ovaria, ligaments, and tubes*, the symptoms about to be mentioned supervene at an earlier or later period (§ 182.).

180. *e. The appearances on dissection* depend upon the direction the disease takes towards the fatal issue. If it has terminated by fatal peritonitis, the usual alterations produced by that malady are found, sometimes with more or less softening of the uterus, or with sero-puriform infiltrations, or purulent collections, in the walls or in the sinuses of the organ, occasionally also in the veins and absorbents in the vicinity. If the disease has not extended to the peritoneum, but has terminated by suppuration, these latter changes are the more remarkable; and no further disease of this membrane may exist beyond some alterations of the portion covering the uterus and appendages, consisting chiefly of exudation of lymph, with little or no serous effusion, but often with puriform infiltrations or collections underneath the peritoneum, and softening of the tissue. Gangrene or sphacelation is rarely observed, unless the autopsy has been delayed longer than twenty-four hours.

181. (*e.*) PUERPERAL INFLAMMATION OF THE UTERINE APPENDAGES. — It is comparatively rare to find, either during life, or on examination after death, the ovaria, broad ligaments, and tubes inflamed independently of peritonitis, or of peritonitis associated with hysteritis, in the more *inflammatory form* of puerperal fever. In the more *synochoid* and *malignant states* of this fever, the uterine appendages are very frequently the seat of lesions hereafter to be described; but they are, perhaps, never found in these latter states affected alone; the peritoneum or the uterus, or both, and often several other structures, being also more or less altered. It is only in the inflammatory or more sthenic form of puerperal fever that these appendages are affected alone, or chiefly, and then only in rare instances. Even when the disease appears to originate in these, which is not unusual, it soon extends to the peritoneum; and, if it preserve its sthenic character, it does not spread much further than to the portion of the membrane adjoining. But, if the asthenic condition exist, or if vital power become depressed, or the blood contaminated by the absorption of matters from the uterus or vagina, the disease soon spreads from the uterine appendages over the peritoneum, if it be not arrested in its progress by treatment.

182. *a.* The *symptoms* of inflammation of the uterine appendages, whether the affection originates in, or extends to these parts, are generally ushered in with rigors, and with pains, tenderness, and fulness in one or both sides of the hypogastrium, extending to the groins, the pains generally shooting down the thighs. As vascular reaction is established, the pulse becomes rapid, the skin hot, the urine scanty, high-coloured, &c.; and headache, thirst, diminished or suppressed lochia, suppression of the milk, and other symptomatic phenomena appear. An examination *per vaginam* evinces increased heat and tenderness at the upper part of the canal, and, in some cases, even a tumour may be felt laterally. When the disease extends to the peritoneum, pain, tension, fulness, and exquisite tenderness advance upwards; and all the symptoms of *peritonitis* supervene, sometimes with others more strictly appertaining to *hysteritis* (§ 176.), with which the inflammation of the uterine appendages may be associated, as either the primary or consecutive affection.

183. *b.* The *terminations* of the inflammation of the uterine appendages are — 1st. In *resolution*, which may take place, as in cases of metritis, without any permanent injury being sustained; — 2d. In *adhesions*, by the medium of coagulable lymph to adjoining parts, which, by their situation or extent, may be injurious at some future period; — 3d. In *obliteration of the Fallopian tubes*, and the consequent loss of function, or sterility, which ensues; — 4th. In *suppuration*, the matter forming either in the ovary, or in the broad ligament, or in the veins. The purulent collections or deposits may exist in these situations in various forms, the patient dying of the attendant softening and disorganisation of the adjoining parts and of the purulent absorption, but most frequently of the consequent or associated peritonitis, and more rarely of the complication with metritis. A large collection of matter in these parts may burst into the peritoneal cavity, or may open into the vagina, or into the rectum, or through the abdominal parietes, near POUPART's ligament. — The appearances on *dissection* are described in the article OVARIA, and in the sequel (§ 229.).

184. *B.* SYNOCHOID PUERPERAL FEVER. — *Congestive Puerperal Fever.* — This form of the malady is that most frequently observed both in private practice and in lying-in wards, unless the causes be intense or concentrated, and then the disease assumes a more malignant character. This form may be sporadic, or endemic, or even epidemic, especially in lying-in hospitals; and in these, as well as elsewhere, it assumes modified states of vascular action and local affection, according to the constitution and other circumstances of the patient, to the relative intensity of the exciting cause, and to the avenues through which this cause affects the frame. Hence it presents, in different cases, every modification, from the inflammatory to the malignant. The same causes, or combinations of causes, as infectious miasms, transmitted by the medium of the surrounding air, or contagious fluids or secretions conveyed by the hands of the accoucheur, aided by concurrent influences, may, in the same ward, or in other places, produce this form of the malady in one female, and the malignant form in another; the state of the female, the period that has elapsed from delivery, the predisposition resulting from uterine hæmorrhage, &c., remarkably favouring the intensity and character of the attack. Thus I have seen in the same lying-in ward, and even in contiguous beds, cases not only of this form, but also of the most malignant form, of the malady, each presenting different prominent affections — one peritoneal disease chiefly, another very remarkable uterine affection, a third prominent alteration of the uterine appendages and peritoneum, and in a fourth inflammation of the veins or lymphatics of the uterus

and its appendages, or of both these vessels. This occurrence, and the circumstances connected with it, indicate two things, namely, the spread of the disease owing to the operation of a cause infectious or contaminating in its nature; and the production of different local alterations, in different cases, in connection with the infection and contamination of the constitution—of the nervous and vascular systems, and consecutively of all the living structures.

185. *a.* The *symptoms* of this form of puerperal fever vary with the circumstances already noticed, and with the mode of its accession. In many cases, the *uterus* is the first to be attacked; in some, the *uterine appendages* are the first to manifest pain, tenderness, &c.; in others, the *peritoneum* appears to be primarily seized; and, in a large proportion, alterations exist chiefly in the *uterine veins*, with more or less lesion of other parts. The mode of accession of the disease is no less varied than the local lesions discovered after death; and neither it, nor the progress of the symptoms subsequently, can always be strictly attached to the several states of the malady so as to indicate them truly during life. The accession of pain is often sudden, and as often insidious, appearing as after-pains, or as an aggravation of these, or merely as the increased sensibility of the uterine organs usually consequent upon parturition. It is frequently attended by chills or rigors, or by a recurrence of these; or the chills may be so slight as to escape observation. In the more robust, and when the powers of life are not remarkably depressed by the exciting cause, the shiverings are often severe; and in these reaction is usually more fully developed, and the disease more nearly approaches the inflammatory or sthenic form. As the chills disappear, the pulse, which was already frequent and small, becomes more frequent and fuller; but still soft, open, and compressible. The skin is hot; thirst, nausea, and vomiting are complained of, sometimes with cough, vertigo, or pain across the forehead. Soon after, or almost instantaneously with, these symptoms, pains in the abdomen are experienced, in various degrees of severity; and the patient lies on her back, with the knees drawn up.

186. *b. If the local disease commence in the uterus*, the pain and tenderness on pressure are first felt in the region of the uterus, and the abdomen, above this region, is soft and flaccid. The body of the uterus is enlarged; and the pain, frequently at first recurring in paroxysms, or presenting exacerbations, is often mistaken for after-pains, until pressure indicates great tenderness, and discloses the nature of the attack. With the aggravation of the fever, the countenance becomes suffused, and the respiration hurried. With the extension of disease from the uterine peritoneum to the rest of the membrane, the pain and tenderness extend upwards over the abdomen, which becomes swollen, tympanitic, acutely painful, and tender. Vomiting of dark-coloured or greenish fluids ensue, often attended by diarrhœa, the stools being dark, offensive, and watery. The pulse soon becomes remarkably rapid and feeble, sometimes irregular; the tongue brown or dry; the teeth covered by dark sordes; the countenance sunk and palid; the breathing short, laboured, and intercostal, with a short suppressed cough, singultus, and eructations of flatus, with which more or less dark fluid is thrown up, without retchings. Coldness of the extremities, remarkable smallness and frequency of pulse, and a cold and clammy surface, with a short, gasping respiration, usher in dissolution, the mental faculties being often but little disturbed.

187. *c. If the local alterations commence in the uterine appendages*, the symptoms generally are but little different from those just stated. Pain, tenderness, and fulness are first felt in either or both sides of the hypogastrium, instead of behind or immediately above the pubis, as when the disease begins in the uterus. The primary affection, however, may be seated in the uterus, without being detected, and extend to the appendages, or both to the uterine peritoneum and to the appendages, and thence, more or less, over the peritoneal cavity. In the early period of these cases, the abdomen may remain for a short time flaccid, and tolerant of pressure; but it soon presents all the symptoms just mentioned, with the severe constitutional infection, which rapidly increases and aggravates the local changes by sinking the powers of life and contaminating the circulation. When the peritoneum becomes implicated to a great extent, the symptoms above described are always present; and, if the disease be not arrested at an early stage, the fatal issue advances as there stated; the lesions observed after death being most remarkable in the uterine appendages, as will be shown in the sequel.

188. *d. That the prominent alterations so frequently seen in the peritoneum* actually originate in it cannot be doubted, in respect of some cases of this form of the disease; for the seat of the early symptoms and the appearances on dissection are not sufficiently demonstrative of a primary affection of the uterus or of its appendages. Nevertheless, it may be admitted that a local poison or a contagious fluid may affect the internal surface of the uterus, and that the change which takes place primarily in this part may be extended along the tubes to their fimbriated extremities, and thence over the peritoneum, the symptoms of the early lesions not being fully developed, or escaping observation, until the peritoneum is extensively implicated. When this membrane is thus primarily attacked, the pain generally commences at the epigastrium or about the umbilicus, is sudden and acute, and is attended by extreme intolerance of pressure, tympanitic distension of the abdomen, a rapid pulse, and vomiting; these symptoms being generally ushered in with chills or rigors, which may either precede or accompany the pain and tenderness of the belly. In some cases the chills or rigors are either slight, or of very short duration, and may thus escape notice; but they are seldom absent altogether in this state of the disease. The pulse is always quick from the commencement, and even before either pain or rigors are experienced. The lochia and milk, in this as well as in the other states of this form of puerperal fever, is either diminished or suppressed from the appearance of the rigors. The urine is always high-coloured and very scanty, or even suppressed; the bowels irregular, the stools at first lumpy, afterwards relaxed, watery, dark, and offensive; and the tongue white or parched, subsequently dark or brown. The countenance is anxious and collapsed, the respiration short,

quick, gasping, and thoracic; and, during the advanced progress of the malady, the acute pain and tenderness of the abdomen subside with the supervention of fluid effusion into the peritoneal cavity, and the tension subsequently also subsides, the abdomen often being very tumid, but soft and swaggy. All or most of the symptoms accompanying an unfavourable termination of the other states of the disease now supervene with a rapidity varying with the severity of the attack, and with the degree of vital power attending it, or of vital resistance opposing the occurrence of dissolution.

189. *e. Inflammations of the veins of the uterus and its appendages, sometimes of the lymphatics, and, in rare instances, of both orders of vessels,* are frequently the primary and essential alterations in the form of puerperal fever now under consideration; but they are not the only changes, especially in fatal cases; for, in these especially, various consecutive lesions, of an extensive and disorganising kind, are also found on dissection, or even become very manifest before death. *Uterine phlebitis* is most commonly observed in the puerperal state; but it may occur, independently of this state, in consequence of ulceration of the os or cervix uteri, or of ulceration consequent upon the presence or removal of polypus. It is *caused* in child-bed by the usual circumstances and influences which occasion other inflammatory diseases in persons weakened or exhausted by prolonged suffering or by losses of blood, these conditions, especially flooding and difficult or instrumental labours, the depressing emotions, and a varicose state of the veins, favouring the occurrence of phlebitis. The chief or essential cause is undoubtedly the circumstance of the vessels of the uterus being placed, by the separation of the placenta, in an analogous state to the wounded surface of a limb after amputation. The irritation occasioned by an adherent portion of placenta, or by the decomposition of it, or of coagula which have not been thrown off owing to the imperfect contractions of the uterus after delivery, is often a cause of this state of the disease. Injury, also, sustained during delivery, and alterations or decomposition of portions of the retained lochia, may either inflame the sinuses or veins, or may contaminate the blood in them, the portion thus contaminated further changing the circulating fluid, and even affecting the vessels through which it passes. The disease of these vessels may, moreover, be produced by the contact of an infectious fluid, or by the changes occasioned in the lochia by the foul air to which this discharge may be exposed, as shown above (§§ 137, *et seq.*).

190. *α. Uterine phlebitis* generally commences in the vessels which have become in some respects exposed by the removal of the placenta, as shown by the frequent limitation of it to the vessels of that part or side of the uterus to which the placenta was attached. It often extends to the veins and sinuses of the greater part of the uterus, and to the veins also of the ovaria and tubes, but chiefly to those of one side, that side being the seat of attachment of the placenta, or principally its seat. Uterine phlebitis is often a simple or uncomplicated disease of the uterine organs, but it seldom continues any time without giving rise to various consecutive lesions, both of adjoining and of remote parts. When it is associated with inflammation of the internal surface of the uterus the phlebitis may be consequent upon this latter lesion; but when the substance of the uterus or the uterine appendages are also inflamed, it is difficult to determine which is primarily diseased. When thus complicated, the veins, in some cases, are most affected, and the substance of the uterus in others. In many instances, however, uterine phlebitis is associated with peritonitis, without the substance of the uterus being materially changed, or merely with slight softening; whilst in some there are not only phlebitis and peritonitis, but also extensive softening of the uterus and of the ovaria and ligaments. It is possible that the alterations of the sinuses, veins, and substance of the uterus may be nearly co-eval; for if we admit the influence of injury, or of retained putrescent matters upon that portion of the uterus to which the placenta was attached, and upon the exposed openings of its vessels, the effects may be produced upon both the vessels and substance of the organ. But it cannot be disproved that inflammation may commence in either and be limited to it, or extended to the other, as circumstances may favour the extension.

191. Inflammation of the uterine veins generally extends to the veins of the tubes and ovaria; but those of the uterus may be inflamed on both sides, and yet the disease may extend only to the veins of one tube or ovarium. M. DANCE states that the veins of the right tube and ovarium are more frequently altered than those of the left. However extensively the veins of the uterus and appendages may be inflamed, the disease may be limited to these organs; but as frequently it is extended to their trunks, even as far as the hypogastric vein, or nearly to the vena cava. It may be asked, however, what are the changes which may be viewed as consequences of uterine phlebitis? and, should the presence of pus, merely, in the uterine veins, be viewed as indicative of inflammation of them? The existence only of pus in the veins of the uterus is not sufficient proof that the pus is a product of inflammation of these veins, for the pus may have been imbibed by the veins from the cavity or internal surface of the uterus, where it had been produced by inflammation of that surface; and therefore unless its existence be associated with changes in the coats of these veins, it cannot be viewed as a satisfactory proof of uterine phlebitis.

192. *β. The symptoms* of this form of puerperal fever—of uterine phlebitis—cannot be stated with the desired precision. Indeed, the accomplishment of the attempt is nearly impossible; for the change is so frequently and so early associated, in puerperal females, with alterations of the substance of the uterus and appendages, and not only with these, but also with changes in the peritoneum and in remote parts, that it is most difficult to separate the phenomena which belong to the phlebitis from those which are attached to the other lesions. The symptoms, therefore, of this form of the disease should be viewed as not strictly those of uterine phlebitis, but of that state of puerperal fever, in which this particular lesion constitutes a more or less important part of the organic changes found after death. That this lesion is an important one in puerperal fevers is shown by the fact, that pus and other changes in the veins have

been found by M. TONNELLÉ in ninety-three cases out of two hundred and twenty-two; and in twenty-four cases out of forty-five by Dr. R. LEE. — But in most of these cases in which it has been seen, it was associated with other changes, as just stated.

193. Uterine phlebitis usually commences, in from twenty-four to forty-eight hours from delivery, with pain in the uterus accompanying, preceding, or following rigors. The uterine region is tender on pressure, and upon the cessation of the shiverings and chills, the lochia and milk are generally found much diminished, and if not altogether suppressed they soon are. The pulse is frequent from the first; and general uneasiness, with physical depression, nausea, or vomitings, and headach, are experienced. As the rigors cease, the skin becomes hot, the pulse more accelerated, but soft, often full, broad, and open, and the vomiting more frequent, a greenish fluid being usually thrown up. With the headach some degree of incoherence may be remarked in some cases, or delirium and agitation in others, which often pass into extreme exhaustion or a state of drowsiness or partial insensibility. Tremors of the muscles of the face and extremities, dysuria, or scanty, or entirely suppressed urine, an irregular state of the bowels, or diarrhœa and offensive stools; extreme thirst, parched mouth, dry and brown tongue; a sallow, lurid, and dirty hue, occasionally with miliary or petechial eruption, and more rarely a dirty yellowish appearance, of the whole surface of the body, generally supervene as the disease advances.

194. The pain in the hypogastrium varies in severity, but it may not increase with the progress of the malady, but the tenderness in this region is generally aggravated, and the abdomen is commonly swollen or tympanitic. If the phlebitis be associated with peritonitis, extreme pain and tenderness of the abdomen, great tension and tympanitic distension of the abdomen are experienced with all the symptoms attending the peritoneal state of the malady (§§ 172, 173.).

195. If the uterine phlebitis proceeds without being associated with inflammation of the pelvic or abdominal peritoneum, little or no pain in the hypogastrium may be complained of; or merely a dull pain, with a sense of weight. But this region will generally be found tender, or painful on pressure. The uterus too may return to its reduced volume, or nearly so, if its substance be not implicated; but, if its substance be diseased, it commonly remains above the brim of the pelvis, and is large, hard, and very painful on pressure. In many instances these local symptoms may be so slight as to escape attention, the constitutional symptoms, caused by the passage of morbid matters into the blood, especially prostration of strength, feeble and rapid pulse, vomitings, and diarrhœa, low wandering delirium, brown parched tongue, diminished, suppressed, or puriform or offensive lochia, &c. at last exciting alarm, and indicating the existence of a most dangerous malady. A large proportion of cases terminate fatally in this more acute stage, — or within eight or ten days; but a larger number live longer, some *secondary affection* supervening.

196. γ. The *consecutive affections* generally appear in remote organs, especially the lungs, pleura, brain, liver, spleen, the joints or muscles, the cellular tissue, the eyes, and digestive canal. One or other of these organs and parts, in the course of a few days, experiences a rapidly disorganising form of congestion or asthenic inflammatory action; softening, puriform or sanious infiltrations, purulent deposits, and even gangrenous softening or liquescence of the tissues, and effusions into serous cavities quickly following the secondary local affection, which is undoubtedly occasioned by the passage of the sanious and purulent matters into the circulation, and by the action of the contaminated blood on the capillaries of predisposed or susceptible parts. Many of these secondary affections advance insidiously, and without being attended with much pain, or local distress, until they reach the last stage of disorganization; whilst others betray much earlier, and by more evident symptoms, the nature of the consecutive mischief. Their progress, generally to a fatal issue, is often rapid; but not infrequently it is much slower; the duration of the malady depending on the seat and extent of the consecutive disorganization.

197. In this form of puerperal fever, the inflammation may be limited to the veins of the uterus, but more frequently the muscular tissue adjoining the veins participate in it, and becomes of a dark-red or brown colour, and remarkably soft consistence, the peritoneal covering of the uterus may also be implicated, and the changes hereafter described be found in the appendages and peritoneum. The veins which return the blood from the uterus and appendages, may be either wholly or in part inflamed; commonly, however, the spermatic are chiefly affected, and generally the one on that side of the uterus to which the placenta was attached; and it may be confined to a small portion of the vessel, or extend throughout it. Injection, infiltration, or condensation of the cellular tissue, in which the veins are imbedded; thickening induration and constriction of the coats of these vessels; and the exudation of lymph, mixed with pus and coagula of blood within their canals, are the changes chiefly observed in fatal cases of uterine phlebitis. The hypogastric veins are more rarely affected than the spermatic. Dr. R. LEE ascribes this to the latter vessels being invariably connected with the placenta; but as in respect of the spermatic, so it is observed as regards the hypogastric, that only one is affected. Marks of disease of the uterine veins may extend by the iliac or the spermatic veins to the vena cava itself. "This occurrence seldom takes place to a great extent, through the medium of the spermatic, the inflammation usually terminates abruptly at the opening of the spermatic into it on the right side, or of the renal on the left. If it pursue, as it sometimes does, the direction of the kidneys, the substance of these organs, as well as their veins, may be involved in the disease."

198. C. MALIGNANT PUERPERAL FEVER. — PUTRO-ADYNAMIC PUERPERAL FEVER. — This most fatal form of the malady — most fatal if not very early, very decidedly, and most appropriately treated — occurs chiefly in lying-in wards, and in circumstances described above (§§ 36—40. 140.). It was the almost only form of the distemper observed in Queen Charlotte's Lying-in Hospital in 1823 and 1824, and until the improvements were made in the house. It is the most certainly infectious and contagious form of puerperal fever,

being often conveyed by the clothes of the accoucheur or nurse. When this disease is produced sporadically by the foul or contaminating air of a close or crowded lying-in ward, or of a low apartment, liable to gushes of foul air from privies, sewers, or cess-pools, it is not infrequently conveyed to other puerperal females as already shown (§§ 137, 138.); and it produces a similar, or but slightly modified, state of disease to that which transmitted the infection. In all its essential characters — as respects its exciting causes, the general depression of vital power, the rapid contamination of the circulating fluids and loss of the vital cohesion of the soft solids, &c. this disease very closely resembles *Putro-adynamic fever (described at § 472, et seq. of art.* FEVER). The chief differences between them arise from the peculiar circumstances of the female at the time of infection; and to these are entirely to be imputed the rapid progress of the puerperal disease, the greater malignancy, if not early arrested by judicious means, and the local complications, which frequently either appear during the course of the malady, or are detected on examination after death.

199. *a. The symptoms* of malignant or putro-adynamic puerperal fever vary in the mode of their *accession* with the period of the puerperal state at which the infection appears to be produced. In three sporadic cases, to which I was called in consultation, the disease commenced in the last week or fortnight of pregnancy; and, in two instances, it either followed or caused abortion, for I was unable to determine the sequence; but, as I traced, as I conceived, the disease in two out of the three sporadic cases just mentioned to the frequenting of privies having no communication with drains, and containing the accumulated exuviæ of many years, it is not improbable that the abortion was the result of a local infection. When, therefore, the infection, poison, or contamination, however, or by whatever channel it may be communicated, attacks a female before delivery, or immediately afterwards, or not until several days have elapsed from delivery, the *accession* of the early symptoms may be expected to vary accordingly.

200. (*a.*) In a case of a female attacked *before delivery*, to which I was called by Mr. BARNWELL, the symptoms were the same as those observed by me in other cases. This patient was seized early on the 12th of February with acute pain throughout the abdomen, with enormous distension and exquisite tenderness; with very rapid, full, and soft pulse, varying from 130 to 136, and with frequent vomiting. I saw her in the afternoon of the same day. The vomiting and state of the pulse were as now stated. She complained of headach, and of thirst, and was very despondent. Her tongue was broad, flabby, slimy, and tremulous; her countenance pale, anxious, and covered by perspiration, and her general surface moist, warm, and clammy. Labour-pains came on that evening, but were soon inefficient, the action of the uterus having ceased. MR. BARNWELL administered secale cornutum, which ultimately induced uterine action, and she was delivered after a labour of about twenty hours. On the following day (the 16th), the distension and tenderness of the abdomen were diminished; and the sickness and vomitings, with borborygmi and flatulent eructations, continued. A pathetic depression of spirits, anxious expression of countenance, flabby and slimy state of tongue, a very rapid, fluent, and weak pulse, clammy state of skin, scanty and almost suppressed urine, quick and oppressed breathing, a feeling of pressure on the diaphragm, requiring the head and shoulders to be elevated, were soon followed by the symptoms ushering in dissolution.

201. (*b.*) When the disease follows *almost immediately upon delivery*, or soon after this event, the earliest indication of the impending mischief is the great rapidity, softness, and weakness of the pulse, often attended by pain and tenderness at the epigastrium, by sickness and vomiting, followed by general distension of, and pains darting through, the abdomen. But, in the majority of cases, there are neither chills nor rigors; in a few a feeling of coldness only; and in still fewer, slight rigors. In this state of the disease the patient soon becomes despondent, predicts her dissolution, is afterwards apathetic, and makes little or no inquiry for her infant. The milk and lochia are either little or not at all diminished, or are more than usually abundant. The abdominal pain and distension are sudden or quick in their accession, but the pain often soon ceases, the distension remaining, and afterwards changing its character, if the disease continues above two or three days. The tongue, from the commencement, is flabby, broad, and slimy, or covered by a mucous or creamy coating; the pulse is usually from 120 to 140, or even upwards, fluent, soft, or broad; and the general surface presents a lurid, or dusky or dirty hue, and is covered by a clammy and offensive perspiration. The countenance is pale and inexpressive, unless when the pain is acute, when it becomes anxious and covered by perspiration. The mind is but little disturbed, beyond a state of complete apathy. As the disease proceeds, respiration is short, suspirious, or difficult; the pulse small and soft, or irregular; the bowels frequently relaxed, and the stools offensive and passed without control. Distressing feelings of sinking, leipothymia or restlessness supervene, and are soon followed by the symptoms of impending dissolution.

202. (*c.*) When the disease does not appear until *two, three, or more days have elapsed from delivery*, the abdominal pain, distension, vomiting, vital depression, and rapidity of pulse, are very often sudden in their accession, and unattended by either chills or rigors; much more rarely, they are more gradual, and attended by chilliness or slight rigors. But physical and mental depression, absence of hope of recovery, of all affection or care for the infant, and of regard for any object whatever, and perfect indifference characterise this form of the malady at whatever period of the puerperal state it makes its appearance. In one case, which occurred in the hospital in 1824, the attack took place above a fortnight after the patient was delivered, and whilst I was in the board-room. When I was visiting some other patients about an hour before her attack, she was sitting in a chair by the fire-place making no complaint; and after this short period I found her complaining of agonising pain over the whole abdomen, with enormous tympanitic distension, extreme tenderness, and a pulse so rapid as hardly to be counted. Vomiting with eructations of flatus, leipothymia, cold, clammy, offensive perspirations, quick.

short, and laborious respiration; failure of the pulse at the wrist; cold clammy extremities; moist, flabby, and tremulous tongue; singultus, eructations or belchings of the contents of the stomach, and loss of power of the sphincters, successively supervened, and terminated in death within twenty hours from the accession of the seizure.*

* The following case, recorded at the time, will illustrate this form of the malady. I adduce it, not as being characterised by extreme malignancy, nor by any marked peculiarity, but as a specimen of the disease as it was then prevalent; and as the treatment which had been adopted was such as could not have influenced the rapid tendency of the disease to dissolution.—Mrs. Turner, married, aged about twenty, was delivered on the 2d Feb., after a natural labour. She was seized on the 11th, without any chill or rigor, with severe pain in the epigastrium, distension and tenderness of the abdomen, rapid, soft, and weak pulse, sickness, and vomiting. The matters thrown off consisted chiefly of greenish fluids; and the pain extended to the hypogastrium and both groins. I was not called to her until the evening of the 13th, about fifty-four hours after the accession of the disease. She then presented the following symptoms:—The pulse was so rapid and weak as hardly to be counted or felt at the wrist: the hands and feet were cold and clammy: the breathing remarkably quick, difficult, and laboured; the countenance sunk, and of a pale livid hue; the conjunctiva pearly, and the pupil contracted: the abdomen was tumid, but not tense nor very painful; the milk was abundant, and the lochia scanty, but not much more so than usual at that period after delivery. The tongue was clean, broad, and slimy, the skin was covered with a clammy, offensive perspiration, and the heat of the trunk was below the natural standard. The urine had been scanty, but passed without difficulty; the bowels duly evacuated. The odour exhaled from the body was peculiar and very marked. Her mind was collected; but indifferent to every thing. She died a few hours afterwards—about sixty hours after the first feeling of disease.

Inspection twenty hours after death, present Drs. COPLAND and DENNISON, and Mr. CHOLMONDELEY. The thoracic viscera presented no further disease than congestion of the posterior parts of the lungs, and loss of vital cohesion. The peritoneum was very slightly adherent in parts by means of a film of puriform lymph which covered the membrane throughout the whole surface. This film was thickest on the right side, and over the diaphragm, stomach, liver, and spleen. These viscera, as well as the kidneys, were healthy, excepting that they were more friable and softer than usual, especially the spleen. The omentum was remarkably softened, and was drawn together, like a cord in the middle of the abdomen between the convolutions of intestines. There was not much fluid effused, but it had a livid and whey-like appearance, especially between the convolutions of the bowels, and between the right ovarium and cæcum. The peritoneum, when the film of puriform lymph was wiped off, was congested with dark blood, in points, or streaks, and much softened, so that it could be torn in parts like to wetted-paper. The uterus was of the usual size, for the period which had elapsed from delivery; and its structure, when divided, appeared natural. The internal surface of the uterus seemed also sound in consistence and colour. The veins of the organ were quite healthy. The spermatic and hypogastric veins, on both sides, were natural, and contained little blood. The right ovarium was of a brownish colour, and slightly enlarged. When divided, a little colourless fluid escaped from the interstices of its structure. The right Fallopian tube appeared slightly inflamed, especially at its fimbriated extremity. No purulent or other matter was found in the sinuses or veins of the uterus. The site of the placenta was somewhat darker than usual at the surfaces, and covered with a dark semifluid lymph; but the vessels proceeding from the part were empty, and of natural appearance. The veins of the heart were much engorged with black blood. The left ventricle was empty and flaccid, the right was filled with black blood. The body was but little rigid, and the external surface slightly discoloured, of a yellowish livid hue. The whole intestinal canal was greatly distended by gas. This and other cases which I have examined have suggested the belief, that in some instances at least, the disease extends from the internal surface of the uterus along the Fallopian tubes to their fimbriated extremities, and thence to the peritoneum. I have frequently observed that the structural changes, both in the ovaria and peritoneum, have been greater in the same side as that in which the fimbriated extremities of the tubes were most altered.

203. (*d.*) Whatever may be the period or mode of its accession, this variety of the disease always pursues a rapid course; and, unless early arrested by energetic means, it almost always tends to general contamination of the fluids and structures, and to death. At its commencement the nervous system of organic life and the blood appear to be suddenly and seriously affected; as shown by the general loss of vascular tone and of sthenic action—by the disturbance of all the vital functions, and relaxation of contractile parts. The earliest symptom is often the remarkable rapidity of the *pulse*, which is also broad, open, soft, or fluent, or small, thready, or irregular—but always very quick and compressible. *Rigors* and chills are generally absent; or if they have been present, they are either slight or of short duration. In the most rapidly fatal cases, or such as occur in crowded or close lying-in wards, they rarely occur; and, in these, the disease may be *uncomplicated*, or present no prominent lesion or affection, the whole frame participating in the malady, through the medium of the organic nervous and vascular systems; or if any prominent lesion appear, the peritoneum and other shut cavities most frequently experience it, and present the appearances hereafter to be noticed.

204. *α.* These more *simple states* of this form of the malady may run their fatal course in from twenty hours to two or three days, the earliest symptoms being remarkable frequency and softness of pulse; pain in the epigastrium or extending over the abdomen, with tympanitic or flatulent distension, and tenderness; frequent vomitings, and sometimes purging; a scanty or suppressed state of the urine; a lurid or dusky appearance of the surface, which is covered by a clammy perspiration, and exhales a peculiar and disagreeable odour; a pallid, apathetic and sometimes slightly livid or sallow countenance, the eyes being sunk, or surrounded by a dark circle; a broad, flabby, tremulous tongue, which is covered by a slimy, or cream-like mucus; little or no thirst; an abundant secretion of milk, and a copious discharge of the lochia, which often becomes offensive or otherwise changed, and great apathy and disregard of the infant and of all relatives. These symptoms may exist in the most marked degree; the respiration becoming short, suspirious, and gasping, the vomitings being more frequent, and attended by belchings of flatus, or passing into a pumping up, or eructations of the contents of the stomach, and alternating with singultus or with leipothymia, and the abdomen still continuing remarkably distended by flatus, until, after a period varying in duration, as just stated, dissolution takes place, preceded either by extreme restlessness, difficulty of breathing, and lividity of countenance, or by sudden or gradual sinking of all the vital functions, and a feeling of impending death. In these cases, the mind may evince no further disturbance than the state of indifference just mentioned, or a low wandering delirium at times, the patient answering correctly when roused, and expressing a conviction of dying, and indifference as to the issue.

205. *β.* When this most malignant form of the disease is *complicated*, or accompanied with any of the prominent lesions to which frequent allusion has been made, the symptoms are somewhat modified either early or in the course of the malady. The most frequent complication is that with effu-

sion into, and other lesions of the *peritoneum*. When this surface is prominently affected, the pain and tympanitic distension and tenderness of the abdomen are most severe, and is either general, or is felt most severely near the epigastrium, or in one or both sides of the hypogastrium, indicating in this latter case the origin of the mischief in the tubes or ligaments. In rare and most severe cases, especially if the malady has followed floodings, dissolution may take place before the peritoneum experiences further change than is presented by other parts; but, more generally, or, if the case continues two or three days, the abdominal pain subsides more or less, and, with it, the tympanitic distension and tenderness partially diminish. The abdomen now furnishes indications of more or less effusion into the peritoneal cavity, which generally increases, and which, by its acridity, increases the loss of cohesion which this membrane evinces after death. In other respects the symptoms of this state of the disease pursue the same course as that just described (§ 204.), varying only slightly with the severity of attack, and the extent of contamination or change of the circulating fluids and the degree of vital resistance opposed to these and other alterations.

206. γ. There can be no doubt of the *uterus* and its *appendages* undergoing, in some cases, and on some occasions, in which this form of the malady appears, more or less prominent changes; but it is very difficult to determine the period of the disease in which they occur, or the exact procession of the morbid phenomena. Although the peritoneum may present the chief lesions, as shown above, in some cases, it is seldom that the uterus, and its appendages especially, are much disorganised without this membrane being also implicated very extensively or throughout. It is very probable, that disease may have extended from the internal surface of the uterus and Fallopian tubes to the fimbriated extremities, and thence over the peritoneum, at least in some cases; and that the uterus may have been so early softened and otherwise affected as to implicate the peritoneum, the change thus induced in this membrane rapidly extending, owing to the infected and contaminated state of the frame. It may not unreasonably be assumed, that the general infection produced by the exciting cause will render the lochia more acrid or septic than in more favourable circumstances, and that this state of the discharge, especially when retained in the sexual passages, may contaminate these parts, and give rise to the changes observed, in some cases, not only in them, but also in the peritoneum and adjoining cellular tissue. I have usually observed that, in these instances, the milk has been undiminished, and the lochia more or less offensive, usually abundant, sometimes remarkably putrid or fœtid. In this complication of the malignant state of the disease, pain, tenderness, and fulness have commenced either in the hypogastrium, or in one or both sides of this region, and extended to the sacrum and loins, shooting irregularly through the abdomen, which has also presented considerable flatulent distension, with borborygmi. The pain has also often extended to the groins and tops of the thighs. In all other respects the symptoms are the same as are observed in the simple and peritoneal states of the malady, but their progress to a fatal issue, although not the less certain, when they are not judiciously interfered with, is generally less rapid, and is often accompanied, as in the former states of the malignant form, with frequent recurrences of faintness or sinking, with dysuria or suppression of urine.

207. δ. In the most malignant states of puerperal fever, the *veins* and *lymphatics* rarely present inflammatory changes. It is chiefly in the synochoid form, or when the disease displays a less degree of malignancy, and pursues a less rapid course (§§ 189, *et seq.*), that purulent matter and other changes are found in these vessels. It does not, however, follow, that morbid matters are not imbibed by either the veins or lymphatics, or even by both, and carried into the circulation because they do not evince any lesion of their parietes; on the contrary, it is not improbable that sanious or putrid matters may be imbibed by the veins, in this form of the malady, and contaminate the blood, without producing sthenically inflammatory lesions, or any very evident changes, in these vessels; the irritation produced by such matters on their internal surface giving rise, in the existing state of the frame, to an ichorous exudation, which is carried into the blood and mixes with it, and not to that form of lymph which coagulates, and arrests the progress of the mischief, nor even to a puriform matter, such as often is met with in the synochoid or less malignant forms of the malady, not only in the veins, but also sometimes in the lymphatics.

208. The *lymphatics* of the uterus and its appendages, and their vicinity, present changes in a few cases which have been viewed as, and which probably are inflammatory. These changes, however, consist chiefly of the presence of pus in the lymphatics, and of congestion of the glands in the vicinity; and are found chiefly connected with inflammatory changes, or with the presence of pus in the veins, or with purulent deposits, or with ulcerations in the pelvic viscera and parietes. The *symptoms* of changes in the lymphatics of the pelvis are hardly to be recognised during life, owing to their associations with the alterations of other parts just mentioned. I have observed these changes chiefly in cases which have commenced with asthenic inflammatory symptoms referable to the uterus and other pelvic viscera, and even also to the pelvic parietes, which have been of several days' duration, from eight or nine to fourteen or more, and which have terminated in one or other of the consecutive lesions already noticed (§ 196.). I have, however, remarked that these cases generally are attended by acute pain in one or both sides of the hypogastrium, extending to the groins, with tenderness, and sometimes with enlargement of the deeper-seated glands in the groins; but the former of these symptoms also accompany prominent affection of the ovaria and ligaments.

209. *D. Of certain symptoms marking the form and terminations of the disease.*—*Rigors* and *chills* have been stated by most writers as ushering in the disease. This is the case certainly in the more inflammatory states, whether of a sthenic or asthenic diathesis, but they seldom occur in the most malignant forms. When they do occur, then generally are the *milk* and *lochia* diminished or suppressed, if, indeed, the secretion of milk has commenced before the accession of the malady. But, in some cases, rigors are experienced without

the suppression either of the secretion or of the discharge; but this is rather the exception than the rule. In the malignant states of the malady, even when effusion into the peritoneal cavity is very great, neither is the milk, nor is the lochia suppressed or even diminished, but, on the contrary, they are more than usually abundant, whilst the latter is often very offensive and contaminating. In the more strictly inflammatory, and in the synochoid or intermediate forms of puerperal fever, suppression or diminution of the milk and lochia generally obtains — suppression in the more inflammatory, and diminution in the synochoid. In the malignant states of the disease observed by me in 1823, 1824, and 1825, the lochia was rarely remarked; but in 1827 and 1828, after better ventilation was established, diminution and occasionally suppression of the lochia were observed: the disease having then assumed the synochoid or intermediate grade of impaired vital power. M. DUGÉS states (*Journ. Hebdom. de Méd.* t. i. p. 348.) that in eighty-nine cases observed by him at the Maternité, there were twenty-five instances of suppression or diminution of the lochia during the rigor, twenty-seven of suppression or diminution in the progress of the disease, and thirty-seven instances in which there was no diminution, but were sometimes an augmentation of the discharge.

210. In some cases in which the lochia is diminished an increase of it takes place after a judicious treatment. But a return of the lochia is not always followed by amendment; and when this result ensues, the return of the lochia is evidently the consequence of the amendment and not the cause of it. In estimating the value of this indication, the time which has elapsed from delivery, and the state of this discharge from the period of delivery, should be considered. It may be stated, as a corollary, that the state of the lochia varies in different epidemics and forms of the malady, and in different individuals even in the same epidemic, or endemic prevalence of it, according to its more or less inflammatory character, and to the kind of complication which marks its commencement or progress.

211. (*b.*) The secretion of *milk*, if established before the attack of the most malignant states of the disease, is generally not influenced thereby; and if the accession of the malady precede the appearance of the milk, the accession of this secretion may occur in the course of the malady. I have seen the breasts full of milk at the period of dissolution, although they appeared more or less flaccid. In all respects, this secretion generally presents the same relations to the forms and states of the fever as have been just stated in respect of the lochia.

212. (*c.*) A correct interpretation of *the pulse* is of the utmost importance in the estimation of the nature, forms, and states of this malady; and is not less so as regards the diagnosis and prognosis. A very frequent pulse—a pulse above 110 after parturition, should always be viewed with suspicion, if the acceleration cannot be accounted for, or referred to mental emotion or physical excitement, although no other symptom be complained of; and inquiries, as well as a more particular examination, should be directed to the secretions and excretions, to the condition of the uterus, and to the sensations excited by an examination of the abdomen and hypogastrium. If, in connection with great acceleration, the pulse is open, expansive, and soft, the inquiries now suggested are the more necessary, especially if pain, fulness, tenderness, or distension in any part of the abdomen be also present. If the pulse rise above 120, the probability of the accession of puerperal fever is much greater, the type or character of the fever being indicated by the tone or resistance furnished by the vessel, and by the various existing symptoms. In the more malignant states of the malady the pulse becomes remarkably frequent, often so as hardly to be counted, and at the same time open, expansive, soft or fluent, as if insufficiently filled with blood. There are also observed, in connection with this pulse, a free and offensive perspiration, copious discharges from the bowels and from the stomach, whilst both the milk and lochia are abundant. These evacuations must necessarily soon leave the vascular system more or less deficient in its contents; and this deficiency must be the more serious, the greater the loss of blood during parturition, and the lower the patient is kept during the first days after delivery, as too frequently directed by accoucheurs, who are more capable of adopting a fashion or mode, than of thinking rationally, uninfluenced by hypothesis, and conformably with the dictates of sound common sense. If we duly consider the effect which the abundant evacuations observed in the course of the more malignant form of puerperal fever must have in reducing the quantity of blood circulating in the vessels, and view this reduction in connection with the impaired tone or contractile power of the vascular system generally, the want of due relation between the quantity of the blood and the capacity of the vessels containing it, must necessarily appear as no mean cause of the leipothymia, faintings, or sinkings so generally observed, and of the rapid progress of the disease to dissolution, especially when a lowering or depletory treatment is adopted.

213. (*d.*) In the more malignant states of puerperal fever *vomiting* is almost a constant symptom. It is generally present from the commencement, and frequently consists at first of a greenish-yellow ropy fluid, afterwards becoming greenish-brown, and lastly nearly black, watery, and turbid. A dark greenish fluid is often ejected from the beginning. At first the vomitings are attended by considerable retchings; but as the disease advances to a fatal issue, the matters are belched up with little or no effort. Vomiting sometimes occurs at the commencement of the disease, then subsides, and is followed by diarrhœa, and afterwards recurs in its worst form, the diarrhœa frequently continuing also.

214. (*e.*) The states of the *bowels* and of the *evacuations* vary considerably in the different forms of puerperal fever. The intestinal irritation, or gastro-enteric disorder, which has been viewed by some writers as a form of the disease, is merely a symptom which is often more or less prominent in all the varieties, but more especially in the most malignant and rapidly fatal, in which depression of vital power, alteration of the blood, and loss of vital cohesion of the tissues, are the most manifest phenomena. In the more inflammatory, and in the intermediate or synochoid forms, the stools are at first bilious, feculent, or frothy, sometimes costive, or not relaxed, or irregular; but they are often relaxed and irregular, or of-

fensive as the disease advances. In the more malignant states the evacuations are generally dark-green, greenish-brown; in a few cases almost approaching to black. They are commonly also fluid, very copious, occasionally slimy, and usually containing numerous small pieces of soft albuminous flakes mixed with them. They are always extremely offensive. Towards the fatal close of the more malignant cases they are often passed involuntarily.

215. *b. The state and appearances of the blood* vary most remarkably in the different varieties of puerperal fever. In the more inflammatory, particularly when the sthenic diathesis obtains, and the disease presents the characters of peritonitis or hysteritis, the blood does not differ materially from the states of this fluid usually seen in other inflammations of serous or fibrous structures. It is chiefly in the inflammatory form that an opportunity of examining the blood, whilst the patient is living, is afforded the physician. But I have been called to cases of the malignant form, produced by infection, in which venæsection has been practised, and opportunities have thus been furnished, fatally to the patients, of observing the appearances of this fluid in that form, during their lives.

216. (*a.*) In the case of a patient who exhibited the first symptoms of *puerperal peritonitis* on the evening of the second day after delivery, the pulse being very quick, hard, and full, the respiration rapid, with heat of skin and thirst, Dr. SIMON found that the blood formed a tolerably firm clot, and was covered by a buffy coat of a line and a half thick; the chemical analysis furnishing very nearly similar results to those about to be adduced from ANDRAL and GAVARRET. These physicians made eight analyses of the blood in four cases — one of *peritoneal fever*, the others of *metro-peritoneal*. Two of the cases terminated fatally, and in these a large quantity of purulent matter was found in the abdominal cavity. The following are the results: —

Venæsections.	Water.	Solid residue.	Fibrin.	Blood-corpuscles.	Solid residue of serum.
1st case 1	787·2	212·8	5·5	122·8	84·5
2d case 1	822·9	177·1	5·4	88·3	83·4
2d case 2	831·6	168·4	5·3	73·6	89·5
2d case 3	851·0	149·0	3·6	60·5	84·9
3d case 1	786·4	213·6	7·2	117·0	89·4
4th case 1	789·4	210·6	3·8	120·0	86·8
4th case 2	802·7	197·3	4·7	109·5	83·1
4th case 3	813·5	186·5	6·1	100·3	80·1
Healthy blood	790·0	210·0	3·0	127·0	80·0

217. The second case, which proved fatal, revealed puriform effusion into the peritoneal cavity. The fourth case did not manifest symptoms of *metro-peritonitis* until the second bleeding was ordered, this disease having been fully developed on the occasion of the third bleeding, when the quantity of fibrin in the blood was greatest. In cases of metro-peritonitis quoted by Dr. DAY, from the analysis of SCHERER, HALLER, BECQUEREL, and RODIER, the blood presented a similar increase of fibrin, and a much greater diminution of blood-corpuscles.

218. (*b.*) In cases of *metro-phlebitis puerperalis*, the clot of the blood drawn from a vein was, according to EBERT, large, and more or less concave. It was covered either with a thin, true buffy coat, or more frequently with a thick and often discoloured stratum of gelatinous substance, forming a false buffy coat. Gelatinous coagula, of a similar nature, were also frequently seen floating in the serum. The microscope often detects pus in the blood, in the course of the disease. In two instances, in which the blood was analysed by SIMON, in this form of puerperal fever, a nearly similar increase of fibrin and diminution of blood-corpuscles to the above were found. The quantity of albumen and of fat in the blood was much augmented, the former amounting to 103·35 and 112·77, the latter to 3·12 and 4·32.

219. (*c.*) I am not acquainted with any analysis of the blood in the most *malignant form* of puerperal fever, unless that which Dr. DAY adduces from HELLER, who states that the blood was of a very dark brown colour. The clot was dark, of a loose consistence, and covered by a buffy coat, over which was a delicate membrane, which presented under the microscope a finely granular appearance, and fat vesicles. The serum was turbid, but after standing for some time became clear; its re-action was alkaline; its specific gravity 1025. The fibrin was 5·16; the blood-corpuscles 77·52. According to BECQUEREL and RODIER, the cholesterine and phosphates are increased.

220. The appearances of the blood in puerperal fever will necessarily vary not only with the form and state of the disease, but also with the period or stage at which it has been taken away. During 1821, 1822, 1823, 1824, and 1825, and even in some following years, when the mischievous writings of ARMSTRONG, and other insufficiently experienced authors, had misled those who trusted to ephemeral and unworthy authority, blood-letting had been resorted to in all cases of this disease to which I was called, some of them having been actually moribund, or even dead before I reached them, in consequence partly of the practice; and on every occasion I was struck by the peculiar faint odour and very dark hue of the blood; by the very soft state of the clot, when the blood did separate into crassamentum and serum; by the appearance, which occasionally presented itself, of a mass exactly resembling in colour and consistence a common jelly, the colouring matter covering the bottom of the vessel in the form of a precipitate; and by, in some instances, a slight separation only of serum, the large, loose, or gelatinous crassamentum consisting chiefly of this jelly-like matter, the lowest stratum of which contained the black or dark-brown precipitate of colouring matter. These appearances of the blood were presented, in several cases in the hospital in 1823, and three or four subsequent years, in which cases blood had been taken before I saw the patients. It may be here remarked that I have seen many cases of this form of the disease in which leeches had been applied to the abdomen; but, in nearly all, and especially in those which occurred in the hospital, the blood which flowed from the bites did not coagulate; and great difficulty, amounting almost to an impossibility, of arresting the bleeding from them, was gener-

observed, owing both to the state of this fluid and to the impaired vital cohesion of the tissues characterising the advanced stage of the malignant form of this domestic pestilence.

221. V. APPEARANCES AFTER DEATH.—The lesions observed after death from puerperal fevers vary remarkably, according to the type and form and complication of the malady; the mode and nature of the infection; and the manner in which the infection appears to have invaded the frame. In the more *inflammatory type*, or in those cases which present much of a *sthenic diathesis* — in which vascular re-action are more developed, and the pulse less frequent and attended with more tone and resistance, the alterations of structure, whether limited to the *uterus* or *appendages*, or to the *peritoneum*, or to all these parts, approach more or less closely to those which are consequent upon primary and uncomplicated inflammations of these structures, and are not materially, if at all different from those described when treating of inflammations of the *uterus*, *ovaria*, and *peritoneum* (§§ 80—98.).

222. *A.* In the *asthenic* or more *malignant varieties* of this distemper, the alterations of structure present different characters from those observed in the more sthenic states, or in those cases which are characterised by greater vascular re-action and vital resistance. In the *most malignant* of these (§§ 196, *et seq.*) the changes consist chiefly of impaired cohesion of the tissues generally, often with more or less of a turbid serous effusion into the serous cavities, more especially into the peritoneal cavity. I examined several bodies after death from this state of the disease, in the years between 1822 and 1830; and during that period, as well as subsequently many others, in which the fever manifested an intermediate grade of intensity between that state and the more sthenic or inflammatory, I made notes at the time of the appearances; and the description of them are derived from these sources.

223. *a.* It was but rarely that death takes place previously to the effusion of fluid into the *peritoneal cavity*. Such an occurrence, however, was sometimes observed in the most malignant form of the malady, especially when the powers of life rapidly sunk, and the patient expired within thirty-six or forty-eight hours. In these cases the peritoneum was finely ingected or congested throughout, especially its venous capillaries; but the injection was not generally diffused; it was usually in the form of spots, patches, or streaks. Those parts of this membrane which were closely in contact, as if pressed upon, were less vascular. The congested patches were generally of a reddish-brown, or livid hue; and the peritoneum throughout of a dirtier and more unhealthy colour than usual. The membrane was soft, easily torn; and with this loss of cohesion it appeared somewhat thickened. These changes were not limited to a single or to several situations, but were general. In some cases, however, they were most remarkable in the peritoneal coat of the intestines, in others, in the *omentum*, which was often contracted, or pushed upwards, very much softened, of a reddish-brown colour, and sometimes so readily torn as to be incapable of sustaining much more than its own weight. This diminution of the usual cohesion of the peritoneum was occasionally attended by little or no effusion in the most rapidly fatal cases, or merely by a delicate film of exudation most remarkable in the open interstices between the convolutions of the intestines and viscera. This film of exudation may be unobserved until the finger is passed over the surface, when it will be collected in a sensible semifluid mass. In several of these cases the inspection was made whilst the body was still warm.

224. In these cases there was but little fluid effusion — not above too or three spoonsful, and that was of a dirty, light-brown, or reddish brown hue; or of a whey colour — more rarely it resembled a sanguineous ichor; but it always possessed an offensive odour. In some instances, at least, it may have been the result of *post mortem* transudation. In cases in which life continued longer to resist the fatal tendency of the malady, or where attempts at re-action had partially taken place, with a nearly similar state of the peritoneum to that now described, there was a greater or less quantity of fluid effused. This fluid, in the more rapidly fatal instances, and where depression of the powers of life, with flaccidity of the muscles generally, was most remarkable, had a dirty or muddy, or sero-sanguineous appearance and fœtid odour, in some cases; and was more abundant in others, and was then, either whey-like, or of a dirty yellowish tinge. When death had not occurred until about the end of three or four days, the effused fluid was often very abundant, consisting of a curdled substance; of which the more consistent part nearly resembled recently curdled milk, the curd being soft, gelatinous, and friable, of a cream colour, or approaching it; and the serous portion closely resembling a pale whey. This effusion was generally most abundant in the pelvis, in the more depending situations and opener spaces between the viscera, and convolutions of the bowels. It is obviously this state of the effusion which induced several French physicians to ascribe the malady to metastasis of the milk. In other cases, the effusion was equally great, but it presented the appearance of an emulsion of a more or less deep yellow, yellowish green, or greyish yellow hue. In some instances, it consisted of a dirty serum, with semifluid, albuminous, or puriform matter mixed with the serum. Occasionally the effused liquid was almost puriform, or sero-puriform.

225. *B.* In those cases, in which the disease, owing either to the robust constitution of the patient, or to the less intense action or concentration of its exciting cause, has not rapidly sunk the frame into dissolution without some degree of sthenic vascular re-action, the peritoneum, in addition to a large effusion of a serous or whey-like fluid, containing flakes or masses of lymph, or of a puriform or albumino-puriform matter of various sizes floating in it, was very generally covered by a thick coating of lymph, or of a substance of a yellowish or greenish-yellow colour, of a soft consistence, in some places slightly agglutinating the opposing surfaces, in others occasioning no adhesion, however slight, and containing in the opener spaces the fluid just described. These exudations were most abundant in the pelvic portion of the cavity and lower abdomen, and sometimes also in the vicinity of the liver, spleen, and diaphragm; and around the omentum, which seldom presented the same appearances in two cases. The odour of this effusion was peculiar and disagreeable, and it, as well as the fluid previously described, was often so acrid as to irritate

the backs of the hands of the examiners of the body.

226. *a.* Even in cases of the greatest effusion, the *peritoneum* was often the most devoid of redness; the congested state of its capillaries, particularly of the venous capillaries, noticed in those cases which terminated most speedily and without effusion, was observed only in parts, streaks, dots, or spots; its surface being of a dirty greyish colour. This membrane itself was opaque, thickened, and somewhat softened, and readily torn, more especially in those parts reflected over the viscera of the pelvis and lower abdomen, but sometimes also in the iliac fossæ, even more remarkably in the omentum, and occasionally in the mesentery, and in that reflected over the abdominal parietes. In a few instances only were slight ecchymoses under the peritoneum remarked. In rare cases only has gangrene of the peritoneum been observed, and only in those portions reflected over the fundus of the womb and the appendages, and over the iliac fossæ; and in still rarer instances has it existed in the peritoneal covering of the bowels. In some cases, probably, this change had taken place, or become more marked, after dissolution. The external or adhering surface of the peritoneum, or rather the *connecting cellular tissue*, in the most rapidly fatal cases, was sometimes slightly œdematous, or infiltrated by a serous or sanguineo-serous fluid, and this was most frequently seen in the omentum, when it was remarkably softened, and in the Fallopian tubes; but it was associated with no farther change in the uterus, appendages, or veins, than slight softening of the former, from participation in the loss of vital cohesion so remarkable throughout the frame. In cases which had continued three or four days, and in which vascular re-action had partially appeared, slight infiltrations of a serous or a sero-sanguineous, or a sero-puriform, or even of a pus-like matter under this membrane were found, occasionally so minute as hardly to be detected, until it was squeezed out upon dividing the parts. When thus slight the peritoneum was opaque, and had a dirty macerated appearance. These infiltrations were most remarkable under the reflections of the peritoneum over the pelvic viscera and iliac fossæ, and in the omentum and folds of the mesentery.

227. *b.* The *viscera* enveloped by the peritoneum were frequently sound, excepting their impaired vital cohesion, and old or pre-existent lesions, and the changes observed in the *sexual organs and their vessels*, which were the next in importance to those found in the peritoneum. These organs in the most malignant and most rapidly fatal cases, as in those which occurred in the hospital during 1823, 1824, and 1825, generally presented no further change than remarkable relaxation, flabbiness, or softening, without any purulent matter having been found in the vessels or sinuses of the *uterus*, this organ being but little or not at all contracted, although several days had elapsed from delivery. The peritoneal covering presented the changes just described, in some cases in a great degree, and in those latter the uterine appendages participated very remarkably.

228. These were often the principal changes in the most malignant states, or when the disease, at its commencement, was not localised in any particular region of the pelvis or abdomen, as in those cases which occurred in the most unfavourable circumstances of deficient ventilation and contamination of the air. But, in the less rapidly fatal, or intermediate states of the malady, where the duration of the morbid action admitted of the development of various complications, or when the disease appeared to originate in the absorption of morbid matter from the uterus and vagina, or from contamination in these situations, not only were those organs more or less altered, but serious lesions were observed also in remote parts. The *uterus* was generally flabby and relaxed; its substance softened throughout, but most remarkably towards the inner surface, or infiltrated by an ichorous, sero-puriform, or purulent matter; its *sinuses* and *veins* containing also puriform matter, or a substance resembling that found in the uterus, a similar matter irregularly filling or distending the veins and *lymphatics* not only of the viscus, but also of all its appendages. None of the cases which I examined during 1823 and 1824 presented these changes in the vessels; the first case in which I found the vessels of the uterus and its appendages inflamed or containing purulent matter, occurred in the spring of 1825. Mr. MULLINS having assisted me in the autopsy.

229. The inner surface of the womb was often covered with a gelatinous layer coloured by partially decomposed blood, or by a dark green, or greenish brown exudation of soft lymph, sometimes by a thick purulent coating of a greenish yellow, or yellowish brown matter; these matters were generally offensive, or even had become putrid at the earliest period of inspection. The changes in the uterus were always most remarkable in the part where the placenta was attached, whether those seated in the substance of the organ or in the veins and sinuses. The *Fallopian tubes, broad ligaments* and *ovaria* were swollen, injected with blood, infiltrated with an ichorous serum, or with pus; their vessels charged with similar matter, and their substance more or less softened, and readily broken down.

230. *c.* The *veins and sinuses* of the uterus are frequently changed, and the *lymphatics* sometimes also implicated, the changes occasionally extending to the whole sexual apparatus and along the spermatic and renal vessels to their trunks. The coats of the vessels, in a few cases, were thickened, the canals partially obliterated, or their parietes contracted in parts and dilated at intervals. The internal surface of the veins was sometimes covered with a false membrane, although it was pale when examined. The adjacent cellular tissue was often infiltrated, or contained purulent or sero-puriform deposits, especially in the iliac fossæ. These changes in the coats and contents of the vessels were in some instances limited to the uterus, in others extended to the appendages; and they occasionally did not exist in the uterus, but were found in the latter parts, and in a few cases they were observed only or chiefly in the spermatic or renal veins. Puriform or other morbid matters were, in a few instances, most abundant in the lymphatics, forming in them small pouches, and more rarely they were found in both the veins and lymphatics. The veins often contained not only ichorous or puriform matter or pus, or these more or less mixed with small, greyish, or light-brown coagula, or with blood variously altered,

but generally fluid or grumous, without any marks of inflammation of their parietes.

231. *d.* The *heart* was usually flabby, softened, or friable. In the more malignant cases these changes were often remarkable; and the endo-cardium was often deeply stained; this change of colour generally extending to the arterial trunks. The cavities of the heart sometimes contained fluid dark blood. A small quantity of a dirty serum, or of a sero-sanguineous fluid, was occasionally effused in the pericardium, especially in the most rapidly fatal states of the malady.

232. *e.* The *diaphragm*, especially at its peritoneal aspect, partook of the changes observed in the peritoneum. Slight infiltrations of sero-puriform, or sero-sanguinolent matter, were seen in a few instances in the connecting cellular tissue, but they rarely extended into the muscular structure. The *mediastinum* was sometimes infiltrated with a similar matter. The *pleura*, in some of the most malignant cases, presented nearly the same alterations as were found in the peritoneum, more especially the diaphragmatic and pulmonary pleura. This membrane was more easily torn than usual, or was softer, or appeared in places œdematous and discoloured, owing to infiltrations of a dirty serum, or of a sero-sanguineous fluid in the connecting cellular tissue. The pleural cavities contained, in some cases, a turbid, or whey-like serum — more rarely a scanty sero-sanguineous effusion. In some of the most rapidly fatal cases little or no effusion was found, whilst in some of the more prolonged malignant cases, the effusion in, and the state of the pleura were similar to those of the peritoneal cavity (§§ 223, *et seq.*), excepting that the quantity of the fluid was much less. In those cases in which the changes were seated chiefly in the uterus and appendages, and in the more prolonged and sthenic form of the disease, the pleura presented either slight or no material alteration.

233. *f.* The *lungs* were generally more or less congested with dark fluid blood, especially at their posterior or more depending parts. Their substance was soft and friable in the most malignant states of the malady. In the more prolonged cases, and when uterine phlebitis existed, they sometimes contained small puriform deposits or infiltrations, or larger collections or abscesses, with greyish hepatization or other changes consequent upon congestive pneumonia.

234. *g. The digestive canal* presented few changes in its mucous surface. Sometimes, however, inflamed patches were observed; and more or less softening of the mucous membrane, especially of the *stomach*, was not infrequent. Occasionally the softening of this organ was attended by erosions and perforations; and more frequently a brownish, transparent, and gelatinous substance was found between the mucous and muscular coats. Softening and perforation of the stomach has been more frequently observed by DUOÉS and others, than I have seen them. This physician thinks that the brownish viscid matter exuded from the perforated portion of the stomach acts upon the adjoining parts as a caustic, softening, dissolving, and perforating them. But these changes, as they respect the stomach and adjoining viscera, are in my opinion, in a great measure, *post mortem*; and are much more rarely observed when the inspection has been made a few hours only after death. The *intestinal parietes* seldom presented other changes than deficient physical cohesion, especially in the most rapidly fatal cases. In a few of longer duration, the glands of PEYER and BRUNNER were enlarged or otherwise changed; but I rarely observed ulceration of them, or in their vicinity. The whole digestive canal was remarkably distended with air, and contained much brownish, or brownish-green fluid matter; that which was found in the stomach and œsophagus being similar to the matters thrown up shortly before death.

235. *h.* The *liver* was covered by the matter described as above as being found in the peritoneum; and a layer of soft lymph, or of a substance similar to that covering the fundus of the uterus, was often interposed between it and the diaphragm, or between it and the stomach, even, in some instances, where the abdominal portions of the peritoneum were comparatively but little altered. The substance of the organ was often softened, more friable than natural, in some cases congested; in others, pale, soft, as if it were par-boiled, and deficient of blood. In rare instances it contained purulent deposits. The *gall-bladder* often contained much greenish bile, which was occasionally thick and ropy. The *spleen* was softened, somewhat enlarged, and, in the more malignant cases, it was so friable and soft as hardly to admit of being handled, even when the examination was made whilst the body was still warm; and the blood contained in it resembled treacle.

236. *i.* The peritoneal coat of the *kidneys* generally participated in the changes existing in other portions of this membrane. The veins of the kidneys in some instances contained puriform matter mixed with grumous blood; and deposits of pus were found in the substance of the kidney generally on the same side as that in which the ovarium and ligaments were most altered or their veins inflamed. The *brain* and *membranes* were rarely diseased, even in cases attended by delirium. Slight softening was met with in a few instances of the more malignant form of the malady.

237. *k.* Effusions of sero-puriform, or purulent matter in the *joints*, especially the hip, elbow, and knee-joints, and more rarely into the shoulder, ankle, or wrist-joints, were met with in the states of the disease complicated with uterine phlebitis, and when the case was protracted beyond five or six days, infiltration of a sero-puriform or sero-sanguinolent fluid into the cellular and muscular tissues were sometimes observed. These fluids were hardly ever encysted; they always infiltrated, softened, and, as it were, decomposed the texture which they infiltrated, the parts around the softened places gradually passing to a healthy appearance. The muscular structure presented a pale-brown hue where it was thus softened and infiltrated; the skin was lurid or dusky, and the part swollen or boggy, occasionally to the extent of some inches. The soft solids passed rapidly to decomposition; the internal viscera, especially the abdominal, being the first to evince the change. In the more malignant form of the malady, this change commenced before the animal warmth had altogether departed. Nearly all my examinations were made before twenty-four hours from dissolution had elapsed, most of them from eight to twelve hours after death. I believe that several of the changes which have been described by some writers have taken place after death, or at least have become more remarkable during the period

between this event and inspection of the body, for decomposition follows death more rapidly in this disease than any other.

238. ii. *Results of post mortem examinations made by some other physicians.*—*A.* M. DUGÈS adduces the results of 341 deaths. In these *peritonitis* was observed 266 times. Of these 266 peritonitic cases the uterus was affected in three cases out of each four. But M. DUGÈS remarks that, if the cases in which pus was found in the veins, and which he believes, with considerable probability, not to have been cases of uterine phlebitis, be abstracted, the ratio of *metritis* would be very remarkably lowered, and reduced to 29 in 266, or 1 in 9. He states that the *ovaria* are affected in the proportion of one to seven cases; and that in the 266 cases, the *stomach* was perforated in 10; the stomach and intestines were inflamed in four; there was single or double *pleurisy* in 40; *pericarditis* in 6; *arachnitis* in 1; *purulent deposits* in muscles in 8. It is not improbable, however, as stated above, that the perforation of the stomach in some of the cases at least, was either a post mortem change, or was increased after death.

239. *B.* The researches of M. TONNELLÉ are more precise.—(*a.*) Of 222 dissections he found *peritonitis* in 193;—alterations of the *uterus* and *appendages* in 197;—lesions of both the *uterus* and *peritoneum* in 165;—the *peritoneum alone* affected in 28; *uterus alone* in 29.—(*b.*) The alterations of the *uterus* and *appendages* were—simple metritis, 79;—superficial softening, 29;—deep softening, 20;—inflammation of the ovaries, 58;—inflammation of the ovaries with abscess, 4,=190.—(*c.*) The alterations of the *vessels* were—pus in the veins, in 90;—pus in the lymphatics, in 32; pus in the thoracic duct, in 3;—suppuration of the lumbar and inguinal glands, in 9,=134.—(*d.*) The *combinations* of these lesions were—*suppuration of veins*, and uterus, in 32;—suppuration of veins and putrescence of uterus, in 11;—suppuration of veins with metritis and softening, in 5;—suppuration of veins with peritonitis alone, in 34;—suppuration of veins alone, in 8,=90.—*Suppuration of lymphatics*, and veins, in 20;—suppuration of lymph. and uterus, in 13;—suppuration of lymph. and softening of uterus, 6;—suppuration of lymph. and simple peritonitis, 3;—suppuration of lymph. alone, 2,=44.—*Inflammation of ovaries* with peritonitis alone, 29;—with various uterine lesions, 27;—with metritis alone, 8;—with softening of uterus, 7;—with suppuration of vessels, 12;—with all the preceding lesions, 6,=89.—(*e.*) The *secondary affections* were, in the *pleura*,—pleurisies, 29;—effusion of blood, 6;—of serum, 8,=43.—In the *lungs*,—pneumonia, 10;—tubercles, 4;—abscess, 8;—gangrene, 3;—pulmonary apoplexy, 2,=27.—In the *heart*, dilatation, 4;—hypertrophy, 3;—pericarditis, 1;—hydropericarditis, 6,=14.—In the *digestive canal*,—softening of the stomach, 8;—perforation of stomach, 5;—ulceration of stomach, 5;—gastroenteritis, 5;—entero-colitis, 1,=24.—In *other parts*,—abscess of the liver, 3;—of pancreas, 2;—abscess in muscles, 14;—infiltration of blood in muscles, 3;—abscess in pubes, 2;—in the elbow, 2;—in knee, 6;—alteration in cellular tissue of pelvis, 6;—sanguineous infiltration, 2,=40.

240. *C.* Of forty-five dissections made by Dr. R. LEE, the *peritoneum* and its appendages were inflamed, in 32;—the uterine *veins*, in 24;—softening of the *uterus*, in 10;—pus in the *absorbents*, in 4. The peritoneum was not altered in thirteen cases of the forty-five; and there was no phlebitis in seventeen. Dr. COLLINS found, in thirty-seven dissections, the peritoneum more or less affected in all; and in seven, fluid was effused in the thoracic cavities similar to that found in the abdomen. The effusion into the peritoneal cavity was of a straw colour in twelve, and sero-purulent, or of the consistence of thick cream in eighteen. It consisted of a sanguinolent serum in seven, and had a glutinous feel when rubbed between the finger and thumb. All these last cases were rapidly fatal, and no coagulated lymph was found in them. In the other cases lymph was deposited in large quantities, and generally, but more especially in the vicinity of the uterus. "The uterus in the great majority was quite natural in appearance; in some it was soft and flabby, and in a few unhealthy matter was found in the sinuses. The ovaries in many instances had suffered much from the effects of inflammation; being generally enlarged, and so softened, as to be broken down by the least pressure."—(p. 398.)

241. VI. PATHOLOGICAL INQUIRIES RESPECTING PUERPERAL FEVERS.—i. *Is inflammation or alteration of the blood-vessels, or absorbents of the uterus, a necessary consequence of the passage or imbibition of morbid matters, or of other infecting agents from the sexual passages into the circulation?*—Although uterine phlebitis exists chiefly in cases which originate in an extrinsic or intrinsic local infection,—which are caused by an internal or external contaminating or infecting agent,—and occurs less frequently or more equivocally when the malady is produced by the general infection of the frame received through the medium of the respiratory organs, I nevertheless believe that, in the latter class of cases, more especially if the patient has experienced flooding, or is vitally depressed, or continues under the influence of an impure or infected air, morbid matters or fluids may be imbibed by the uterine vessels, or absorbed from the sexual passages and carried into the circulation to such an extent as to contaminate the circulation and infect the whole frame, without producing any inflammatory alterations of the vessels. I was so impressed by the symptoms and course of the disease, and by the examination of the bodies after death, in 1823 and the following years, as to infer at that time, and subsequent experience has confirmed my belief, that morbid matters, or altered or putrid fluids are imbibed, in the circumstances just mentioned, and passed into the circulation, producing the effects now specified without inflaming the vessels, or producing such a change in their internal surface or in their parietes, as may be recognised by the unaided senses; and that the passage of these matters from the uterus into the circulation may take place so rapidly and so efficiently as to produce their effects in so malignant a manner, and in so short a time, as not to admit of the production of the usual alterations consequent upon irritation of the vessels along which these matters have passed. From this it may be inferred, that the absence of change in the uterine vessels is not a conclusive proof, in rapidly fatal cases of puerperal fever, that morbid matters, or altered fluids, or other infecting agents,

have not been imbibed from the uterus and carried into the circulation. When the imbibition of such matters or agents takes place without causing in the first instance irritation, inflammation, and its consequences in the vessels, there is every reason to believe that the effect upon the frame will be the more immediate and intense, owing to the absence of these changes, and to the free passage thus afforded to the morbid agents about to enter into the current of the circulation. Whereas, there are equally cogent reasons for concluding that, when the morbid matter excites inflammation of the vessels which imbibe it, the passage of it into the circulation will be either altogether prevented, or retarded, or diminished by the inflammation thereby produced.

242. ii. *Are the uterine vessels actually inflamed in all, or even in the majority of instances, in which they contain pus, puriform, or other morbid matters?* — When the disease is not arrested by the prompt adoption of rational and decided means, or when such means have not been employed early, or not at all, then the altered fluids, an offensive or putrid lochia, or the secretion produced upon the internal surface of the uterus may be imbibed by the vessels, and either inflame them, or contaminate the blood without inflaming them, as inferred above (§ 241.), or may both inflame the vessels and contaminate the blood. That the vessels are inflamed, and present the changes consequent upon inflammation, are amongst the most frequent changes observed in this disease; and that matters similar to those covering the internal surface of the uterus, or in its cavity, are also found in the veins, and that even puriform matter is seen in these vessels, sometimes without any marks of inflammation of the containing vessels, are undisputed facts, and serve to confirm the view, already stated, that these matters may pass into the circulation and change the blood without leaving any signs of phlebitis. It is not improbable that, when the passage of morbid matters from the cavity of the uterus into the veins takes place towards the close of life, or when it has been increased at this period of the malady, the change of the blood remaining in these vessels will then be more manifest; and the contents of the vessels will more closely resemble the morbid matters existing in the uterus, or will be more or less altered, owing to admixture of these matters with the blood; and that, whilst the matters found in the vessels will thus be much altered, the state of vital power and vascular action at this period of the malady will preclude the occurrence of inflammatory changes in the vessels by which these matters were imbibed. It may, therefore, be concluded: — 1st. That the morbid matters found in the uterine vessels may be the products of inflammation of these vessels, and, in this case, inflammatory appearances or changes are also found in the coats of the vessels; — 2d. That they may have been imbibed from the uterus, and their presence may have caused irritation and inflammatory alterations in the vessels; — and 3d. That they may be imbibed by the vessels, pass through them, or be retained in them, especially at an advanced period of the disease, or near the close of life, and yet fail of producing any marks of phlebitis, although contaminating the blood and all the frame.

243. iii. *Are the softening and other changes often found in the substance of the uterus and of its appendages the results of inflammatory action, and to what other pathological conditions may they be imputed?* (*a.*) Certain of these changes are the undoubted consequences of inflammation, others are the results of a very different state of vital and vascular action. Even the most obviously inflammatory lesions are not referable to pure sthenic action, but rather to an asthenic or diffusive state, unattended by the exudation of a healthy lymph, and characterised by its tendency to spread, to soften, dissolve, or disorganise the parts which it affects; and to infiltrate them with a sero-puriform or sero-sanguinolent matter. The flabbiness of the parts, their swollen, softened, and infiltrated states, their friable and almost putrescent conditions in some instances, and the deposits of puriform matter, without any cyst or exudation of firm lymph in others, evince the asthenic character of the vascular action, of which these changes are the results. In some cases, especially when vital power is less depressed, and the disease is more prolonged, the matter found in the substance of these organs is more consistent, in larger collections, and more nearly approaches that produced by sthenic action.

244. (*b.*) The depression of vital power and contamination of the circulation caused by the exciting or infecting agents, when they operate energetically, occasion changes in the lochia, or so affect the fluids exuded from the internal surface of the uterus and sexual passages as not merely to irritate the parts with which they come or remain in contact, but also to contaminate them locally, so as to partially dissolve their vital cohesion, to soften and almost liquefy or putrify them, even before life has taken its departure. This local contamination thus supervenes upon the general infection produced by the poisonous agent, and in proportion to the intensity of its operation, relatively to the remaining power of vital resistance, will be the extent of change, — of softening or disorganisation that will result in the uterus, in the ovaria, and in the ligaments, the mischief extending moreover to the peritoneum, and spreading throughout its surface with a rapidity proportionate to the reduction of vital power and to the contamination of the circulating fluids. In many of these cases, the softening and disorganisation of the uterus and appendages, especially of the ovaria, are carried to the utmost extent. If, however, the examination of the body be delayed beyond eighteen hours after death, these changes may be viewed as partly *post mortem*.

245. iv. (*a.*) *Is the peritonitis existing in the majority of cases of puerperal fever a primary morbid condition;* — (*b.*) *or is it consecutive of the infection and febrile action;* — (*c.*) *or is it the result of an extension of the morbid action from the uterus and appendages to this membrane?* These are questions by no means easy to solve, for they admit of being answered both affirmatively and negatively, inasmuch as there is reason to believe that the procession of changes is different, or even opposite, in different cases or forms of the malady, and according to the channels through which the causes invade the frame. — (*a.*) Instances have occurred in which I have believed the disease to originate in inflammation of the peritoneum, of greater or less extent, the accompanying fever preventing varying grades of

action between the sthenic diathesis on the one hand and the asthenic on the other. The peritoneal affection may be primary, and yet appear as a complication, or as a consecutive lesion, especially when it occurs very soon after labour, or is developed with the reaction following the shock produced by parturition. Indeed, both the fever and the peritoneal affection may be coetaneously produced; the latter, commencing as reaction, follows the depression caused by delivery, or by the exciting causes of the malady. This latter mode is probably that which actually obtains most frequently, whether the disease is characterised by sthenic or inflammatory action, or by asthenic action, or marked deficiency of vital power. But, as reaction is adynamic and imperfect in the latter cases, the prominent affection of the peritoneum in these is modified accordingly, and presents alterations varying in extent and character, especially as regards the fluid effused, with the intensity or concentration of the cause, with the state of vascular action and vital power, with the constitutional peculiarities of the patient, and with the several circumstances of the case.

246. (*b.*) That the peritoneal affection may, however, be consecutive of the constitutional infection and febrile action, at least in some instances, is shown by the fact, that death has taken place, although in comparatively rare cases, before the peritoneum has presented a more remarkable change than other parts — before exudations of lymph or fluid in its cavity had supervened; such cases having occurred in the same ward, and in similar circumstances, with those in which the peritoneal symptoms and effusion into the cavity were most prominent; in some of these cases, effusions of fluid have also taken place into the pleural cavities, and even into the pericardium.

247. (*c.*) That the changes in the peritoneum are often an extension of those which had previously taken place in the substance or vessels of the uterus and its appendages cannot be disputed. The phenomena characterising the progress of the malady; the occasional limitation of these changes to the peritoneum reflected over the pelvic viscera, the uterus and appendages, in some one or more of their constituent structures, being more or less altered; and the frequent extension of the peritoneal changes, as distinctly marked by the symptoms, from the pelvic peritoneum to the reflections of this membrane over the abdominal viscera and diaphragm, demonstrate that the abdominal alterations often commence and advance as now stated. In those cases which originate in a local infection, and even in those where the general infection is followed by a local contamination, it may be reasonably inferred that the morbid irritation and its consequences, thus produced in the internal surface of the uterus, extend along the sexual passages — along the Fallopian tubes to their fimbriated extremities, and thence to the peritoneum, over which it spreads with a rapidity great in proportion to the intensity of the infection, and to the prostration of vital power and resistance.

248. v. *In what manner are the consecutive changes in the joints, cellular and muscular tissues in the eyes and in the viscera, to be explained?* These consist chiefly of the deposit of puriform matter, in smaller or larger collections, and of infiltrations of this matter in the softened, disorganised, or otherwise altered structure; and are only sometimes observed. That they are to be referred to the imbibition or absorption of puriform, or ichorous or putrid matters from the uterus into the circulation, or to the passage of a purulent or ichorous fluid into the blood from irritation or inflammation extending from the sinuses and capillary veins of the uterus and appendages, is generally admitted; either modes of contamination, or both occurring according to the early states and peculiarities of the case. The morbid matter, having thus passed into the blood, excites and developes a diffusive form of inflammation, with puriform deposits, softening and disorganisation of those parts which are most predisposed by previous disorders, by depressing influence, or by impaired vital resistance. These consecutive or secondary purulent collections and destruction of parts have been viewed by some as resulting from the mere deposit of the morbid matter circulating in the blood; whilst others more correctly consider it as the termination of an asthenic, gangrenous or destructive form of inflammation produced by the presence of the imbibed contaminating matter in the circulation. This matter, by acting upon the interior surface of the capillaries, produces effects much more disorganising and diffusive than those resulting from the usual states of inflammation consequent upon external irritation. Although these secondary lesions are most frequently seen after puerperal fevers, and uterine phlebitis occurring in the puerperal state, they supervene in various other circumstances; and as I shall show in the article UTERUS, sometimes upon ulceration of the *os uteri*, and of other parts. This subject is more fully discussed in the articles ABSCESS (§§ 24, *et seq.*), ABSORPTION (§§ 15, *et seq.*), CELLULAR TISSUE (§§ 10, *et seq.*).

249. VII. DIAGNOSIS. — After what has been remarked respecting the forms and states of puerperal fever, and the descriptions of these forms and of the appearances after death, it is unnecessary to do more than briefly to notice this topic. The *diagnosis* of fevers in the puerperal state has, however, been very loosely stated by some writers, and most inaccurately by others; whilst, by nearly all those who have written, with a dogmatism and self-sufficiency which would be ridiculous if they were not most mischievous, and actually destructive of life in the most interesting epoch of female existence, the inflammatory form has been assumed as the type of all the others. Most writers, even the most recent, have described and attempted the diagnosis of puerperal fevers, with reference only to the local or prominent affections presented at their commencement or their course, and with entire neglect of the different states of vital power and resistance which characterise their several forms, more especially the synochoid and malignant. The vital depression, the poisonous contamination, the mental apathy, or rather the despondency conjoined with indifference, characterising the worst cases from their commencement, and the origin of such cases in infectious causes, — in foul air, poisonous effluvia, contagious emanations, &c., even of a domestic nature, and which I have fully described at another place (see PESTILENCE, PRESERVATION FROM, §§ 10, *et seq.*), — heightened, favoured, or predisposed to, by the exhaustion consequent upon parturition, and the state of almost inanition, or of deprivation of requisite nourishment and even of

accustomed stimuli in which puerperal females are often kept too strictly or for too long a period — are pathological conditions, and etiological circumstances, of the greatest importance, not only as respects the diagnosis, but even more as regards the indications and the means of cure.

250. *A.* The *inflammatory form* of the disease, occurring either as *peritoneal*, or *metro-peritoneal*, *puerperal fever*, are indicated by the mode of accession, by the seat of pain and tenderness, by the vascular re-action consequent upon shivering, by the state of the pulse, especially its hardness in the former and its fulness and firmness in the latter; by marked diminution or suppression of the milk and of the lochia; by thirst and dryness of the mouth and tongue; by the often costive state of the bowels at the commencement and by irregularity afterwards, the evacuations being offensive, and by scanty urine, the excretion of it being more or less disordered. Peritonitis, occurring in the puerperal state, presents most of the symptoms described when treating of *inflammations of the* PERITONEUM, the disease assuming more or less of a sthenic form on the one hand, or of an asthenic on the other, according as the disease is inflammatory, synochoid, or malignant, the symptoms and lesions found after death very closely approaching, or being identical with those described under that head, the chief difference arising from the constitutional influence exerted by the puerperal state, by the constitutional infection, or by the exhaustion, or inanition, or other circumstances of the patient. — (*a.*) Peritoneal puerperal fever cannot be confounded with *gastro-enteric irritation* (§§ 103, *et seq.*), if the abdomen be carefully examined; for, in this latter, the abdomen is not tympanitic, nor tense, nor very tender on pressure; nor does it usually appear so soon after delivery, nor cause so marked constitutional disturbance, as the peritoneal or metro-peritoneal disease. — (*b.*) *Ephemeral fever* cannot be mistaken for any state of inflammatory or synochoid puerperal fever, inasmuch as the former is unattended by the severe abdominal pain, tympanitic distension and tenderness characterising the latter; and is moreover a much less severe disease, of much shorter duration, soon terminating in a copious perspiration, the lochia being uninterrupted, and the breasts continuing distended.

251. *B.* Puerperal fever, commencing either as *hysteritis* or as *ovaritis*, or affecting chiefly the *ligaments*, and either limited to these, or extending thence, to a greater or less extent, over the peritoneum, whether it assumes an inflammatory or sthenic type, or a synochoid or asthenic, will generally be recognised by the severity of the constitutional symptoms; by the persistence of the local signs, especially the pain, tenderness, fulness, and tension in the hypogastric and iliac regions, shooting through the abdomen, to the loins and tops of the thighs; by the rapidity of the pulse, prostration of strength; by the dysuria and irregularity of the bowels; and by the diminution, irregularity, and offensive state of the lochia. If the *peritoneum* continue unaffected, the abdomen will be neither tympanitic, nor tense, nor tender; excepting towards the pelvic regions, where the pain, tenderness, and fulness will be considerable, and the uterus will generally be felt hard and enlarged. The persistence and duration of these symptoms, the grave character of the attendant fever, the disordered states of the secretions and discharges, will distinguish these states of puerperal fever from *after-pains*, from *ephemeral fever*, and from *gastro-intestinal irritation*.

252. *C.* The *malignant form* of puerperal fever often arises from similar infectious and contaminating sources to those which produce putro-adynamic fever; and it may be considered in every respect a putro-adynamic fever in the puerperal state, presenting all the characters of this fever in an aggravated form. It is distinguished chiefly by the absence of chills or rigors at its accession, by a remarkably rapid, soft, broad, open, and compressible pulse, which soon becomes small, weak, fluent, and irregular; by a broad, flabby, or tremulous tongue, covered by a slimy or cream-like mucus; by the little, or almost entire absence of thirst; by the character of the discharges from the stomach and bowels, as above described (§ 214.); by the persistence of the milk and lochia, or the greater abundance and more putrid state of the latter; by the dusky, lurid, or sallow appearance of the general surface and countenance; by the free, clammy, and peculiarly offensive perspiration; by the frequent recurrence of faintness or of a sense of sinking, with moral apathy and vital depression; by the manifest contamination of the circulating fluids and impaired vital cohesion of the tissues; by the quick and peculiar state of perspiration; by the extremely tympanitic distension of the abdomen, and the almost constantly rapid progress of the malady to dissolution, if not early arrested by judicious means; singultus, eructations of flatus and dark fluids from the stomach, a dirty livid hue of the face and general surface, and loss of the power of and control over the sphincters, ushering in death. After death, the rapid accession of putridity, especially of internal organs, the pelvic particularly, and the little or no diminution of bulk — the almost entire absence of emaciation, notwithstanding the free discharges from the stomach, bowels, and skin during the disease, remarkably attract attention.

253. The malignant form of puerperal fever has been considered by many, especially when the peritoneum is prominently affected, as an *erysipelas* of internal surfaces and organs in the puerperal state; and by others, as *typhus*, or *typhoid fever*, modified by this state. — (*a.*) The evidence adduced above (§§ 151, *et seq.*), and the facts which have fallen under my own observation as early as 1826 and 1827, have convinced me of a connection between *erysipelatous* and *puerperal fevers*, arising chiefly out of a similarity if not identity of their respective predisposing and exciting causes, and of the constitutional — nervous and vascular — conditions existing in their progress, and characterising their terminations; the connection being remarkable chiefly as respects the synochoid or intermediate states of puerperal fever, more especially that with prominent affection of the peritoneum. It cannot be said that both maladies are *identical*, for their respective seats are altogether different. The connection or similarity I now point out certainly obtains in a remarkable manner, and is of great importance as respects both the origin and treatment of puerperal fevers. A similar connection may, however, be traced between several other malignant maladies, arising out of their exciting causes, and their prominent pathological condi-

tions, tendencies, and terminations. A septic or contaminating animal poison, varying in kind, administration, application, and avenue of invasion, is the exciting cause of them all; and, whilst this cause depresses organic nervous power, contaminates the circulating fluids, loosens the vital cohesion of the tissues, weakens constitutional or vital resistance, and disposes the whole frame to dissolution, it thereby generates miasms, exhalations, and secretions, equally poisonous with itself, and produces effects altogether similar to, if not identical with, those which itself had produced. In this category of effects may be arranged the severer forms of erysipelas, diffusive inflammations of the cellular tissue, poisoned wounds in dissection—the necroscopic poison—puerperal fevers, especially the synochoid and malignant, putro-adynamic fever, and other fevers of a malignant form, which are generally produced by animal emanations or poisons.

254. (*b.*) The opinion as to puerperal fevers being prevailing *typhoid or other fevers*, occurring in the puerperal state, may be thus disposed of:—1st. The most malignant form of puerperal fever does not produce typhus or typhoid fevers in other persons however susceptible they may be, by age and otherwise, of the infection of these fevers; as shown on several occasions both in lying-in institutions, and in private practice. 2d. When other fevers, both typhous and exanthematous, occur in the puerperal state, whether the invasion of such fevers have taken place immediately before or very soon after parturition, these diseases retain their distinctive characters, although they are generally much more severe in the puerperal state, as I have observed on various occasions. As respects the exanthemata, the diagnosis requires no remark; but in respect of typhus fever appearing after delivery, a few observations may be here offered.

255. (*c.*) *Typhus* or *typhoid* fever may appear after delivery, from infection either shortly before or soon after this event. And it is not improbable that an adynamic or typhoid fever may occur in the puerperal state, owing to great anxiety of mind, or other moral emotions, or to exposure to various morbific exhalations. When, however, typhoid or adynamic fever occurs during childbed, it generally assumes a more than usually severe and almost malignant form. The patient complains, after chills or rigors, of severe pain of the head, back, and lower extremities; rapid pulse; dry, hot, and acrid skin; wandering or low delirium, occurring first at night, and becoming permanent, the ideas running upon one subject; deafness, and suffusion of the conjunctivæ; grinding of the teeth, thirst, and dryness of the mouth, the tongue being loaded, brown, or furred, dark, and dry. The position of the patient is on the back, with the knees but little or not at all drawn up. During the delirium, the patient gives short but rational answers when roused. The countenance is sunk, livid, or sallow; the features are afterwards sharpened; and the delirium passes into coma, with subsultus tendinum. The pulse varies from 100 to 120 or 130, and is generally soft and quick; respiration is quick, and accompanied with frequent sighing; the abdomen is not remarkably, or but slightly, tumid or tender; the bowels, at first, are slow or costive, subsequently irregular or relaxed, the stools being offensive; the urine is scanty and turbid, sometimes suppressed; and the milk and lochia are early diminished, and soon afterwards entirely suppressed. At last the patient sinks down in bed; the tongue is dry and dark; the evacuations are involuntary, and without consciousness; and eschars form on the parts most pressed upon. The duration of the fever is generally longer than that of any of the forms of puerperal fever, and is seldom shorter than fourteen days, and is sometimes above twenty-one days. The history of typhoid fever in the puerperal state shows several points of difference from puerperal fevers; indeed, the phenomena just described are distinctions between these fevers, most of them not existing in the latter; and, in addition to these, petechiæ are observed in typhoid, and the measly eruption in true typhus, these never appearing in any of the forms of puerperal fever.

256. VIII. PROGNOSIS.—An opinion of the result of a case of puerperal fever should depend chiefly on the form and state of the disease, in respect both of the character of the constitutional disturbance and the prominent local affection, and on the period of its progress, and the effect produced by treatment.—*a.* In the *inflammatory form* of the malady, a *favourable issue* may be anticipated from a gradual abatement of the acute symptoms; from a return, or an increase, or a more natural state of the secretions and excretions; from a diminution of the pain, distension, tenderness, and tension of the abdomen; and from a less frequent and more natural state of the pulse. An *unfavourable result* is indicated by the appearance of delirium; of increased distension of the abdomen, which becomes round and very prominent; by an aphthous eruption in the throat; by increased frequency and irregularity of the pulse; by a sudden cessation of pain; or by evidence, by percussion, of copious effusion into the peritoneal cavity; by sinking and sharpening of the features; by continued eructations of flatus with dark fluid matters from the stomach, and singultus; by rapid or gasping respiration; by cold, clammy perspiration, or a similar state of the extremities; by involuntary evacuations and restlessness; these latter phenomena indicating speedy dissolution.

257. *b.* The *synochoid*, or *intermediate, grades* of puerperal fever furnish nearly similar phenomena to the above, by which their terminations may be anticipated; for, although the sthenic diathesis obtains at the commencement, or during the early progress of the inflammatory form, still it more and more nearly approaches the synochoid or asthenic, as respects both the constitutional disturbance and the local changes, as the disease continues, especially as it proceeds towards an unfavourable issue; so that an advanced stage of the inflammation differs but little from the same period of the synochoid form, as respects the indications of the ultimate result. In this latter form of the malady, treatment is seldom availing, unless it be early and decidedly prescribed; and unless symptoms of amendment, or at least of alleviation, soon follow the remedies employed. If the secretions and discharges have been suppressed, the return of these; an improvement in the states of the pulse and of the abdomen, as ascertained by a careful examination; and the capability of turning or of lying for a time on

either side, are the chief indications of a *favourable issue;* and these may not continue long, an exacerbation of all the symptoms sometimes occurring, and soon carrying off the patient; or an alleviation of the more painful symptoms may take place, the pulse still continuing rapid, and after a very few days be followed by secondary affections, as described when treating of the metrophlebitic state of the malady, which ultimately destroy the patient.

258. An *unfavourable issue* is indicated by the symptoms already mentioned (§ 256.), and especially by the character of the vomitings and of the matters thrown up; by singultus and the state of the respiration; by faintness or leipothymia; by failure or irregularity of the pulse; by the amount of effusion in the abdomen, as indicated on percussion, and by the toleration of percussion in connection with effusion; by the suppression of urine; by the indifference of the patient to her child, and to all other objects; and by an early entertained idea or anticipation of an unfavourable result by the patient herself. Sinking of the animal heat and of the features, and a lurid hue or lividity of the face, extremities, or surface generally, indicate approaching dissolution.

259. *c.* The *malignant form* of the malady often manifests the result from the accession of the attack, especially in the suddenness and severity of the appearance of the abdominal symptoms. This form of the disease is seldom recovered from, if it continue but a few hours, without the administration of appropriate and energetic means; and, unless these soon procure an alleviation of the symptoms, especially of the vomitings, and of the pain and distension of the abdomen, and an improvement in the pulse, particularly in diminishing its frequency and in improving its tone, hopes of recovery should not be entertained. The symptoms just enumerated usually precede a fatal issue; and that issue may be expected if the lurid, dark, or nearly livid hue of the countenance and surface; the clammy and peculiarly offensive state of the perspiration; the putrid odour of the lochia; the moral apathy, and mental and physical depression, appear soon after the attack; inasmuch as these symptoms indicate a contamination of the circulating fluids, and a depression of organic nervous energy which is rarely removed. A soft or flabby state of the tissues in conjunction with the gastric symptoms described above; a pulse too fast to be accurately counted; loss of power over the sphincters; absence of abdominal pain, the abdomen continuing tumid, with a swagging or tremulous motion when struck or examined, loss of pulse and coldness of the extremities, are rapidly followed by death.*

260. IX. PATHOLOGICAL INFERENCES. — (*a.*) *Puerperal fevers* are varied in the character or type of the constitutional disturbance, and in the seat or seats of the prominent local changes. — (*b.*) They present the most inflammatory and the most malignant forms — the most sthenic, or the most asthenic or ataxic, with all intermediate grades, according to the nature of the exciting causes, and the mode of operation or avenue of invasion of these causes — as the local affection is primary or consecutive, and as the constitutional disturbance, with its secondary changes, are the effects of infection by an animal miasm or poison. — (*c.*) Owing to these varied constitutional conditions — to these different grades of vital power and resistance, and diverse complications, the arrangement of the forms of these fevers must necessarily be arbitrary and conventional, inasmuch as each form is not defined by any precise limit or line of demarcation, but passes insensibly into that nearest it in grade or character. — (*e.*) The contaminating or poisonous influences of the causes upon the circulating fluids and their depressing effects upon organic, nervous, and vital power, affect the states

* Dr. COLLINS, formerly the resident physician of the Dublin Lying-in Hospital, states that of *eighty-eight* cases *one* was attacked before delivery; *one* in six hours after delivery; *one* in nine hours; *one* in ten; *three* in twelve; *one* in thirteen; *one* in fifteen; *two* in seventeen; *one* in eighteen; *one* in twenty; *one* in twenty-one hours, and *two* in thirty hours. *Thirty-two* were attacked on the first day; *twenty-nine* on the second day; *eight* on the third; *two* on the fourth; and *one* on the eighth day. The attacks were earlier than those observed by me in Queen Charlotte's Lying-in Hospital in 1823, and the seven following years. During that period, the majority of the cases were of the most malignant type, and the largest proportion of the attacks were on the second, third, and fourth days. In one most rapidly fatal case the attack was on the fifteenth day from delivery. The statement of Dr. COLLINS that in only thirty-three cases out of eighty-eight was the accession of the malady attended by shivering, very nearly agrees with my own experience, which also is in accordance with the following: — In *fifty-six* deaths, this termination took place at these periods from the attack viz.:—*Two* in twenty-four hours; *one* in twenty-seven; *one* in thirty-six hours; *nine* on the second day; *fifteen* on the third day; *thirteen* on the fourth; *four* on the fifth; *four* on the sixth; *three* on the seventh; *two* on the eighth; and *one* on the eleventh day. "*Forty-four* of the eighty-eight cases occurred in women who had given birth to *first* children; *sixteen* with *second* children; *nine* with *third*; *six* with *fourth*; *seven* with *fifth*; *two* with *seventh*; and *four* with *eighth* children. *Thirty* of the forty-four women delivered of *first* children died. *Fifty-four* of the eighty-eight gave birth to *male* children." Dr. COLLINS adds, that "when he was assistant physician in 1823, puerperal fever raged to an alarming extent. The Master (physician) of the hospital was a strong advocate for the free removal of blood *generally* at the commencement of the attack. With his approbation it was resorted to with great frequency, and in the promptest manner. The effect on the patient and the mortality was such as to satisfy him fully of the inexpediency of adopting this line of treatment." It may be remarked in palliation of such adoption, that just before this outbreak of the fever several works had appeared filled with the results of an experience of a few months' duration of this malady, most of them written before the authors were of legal — certainly not of medical, age, although distinguished by the title of doctor; which results were dogmatically, and, to my own knowledge of one of these productions, falsely adduced in favour of blood-letting. In the case of this malady, as in that of a somewhat similar pestilence, blood-letting was once extolled as the "*sheet anchor*" of treatment, especially by the naval wielders of the lancet, who like DOVER of old rendered this minute instrument of mighty mischief one of the greatest importance with those who credulously received assertions as facts, and believed all assertions according to the confidence with which they were made. Early in the present century a work appeared on the diseases of inter-tropical countries, in which blood-letting was the first "sheet anchor," and calomel was the second. In it all preceding writers were ridiculed, and told they knew nothing of what they had written upon, and these remedies were considered so good that patients could hardly have too much of them. This work was the guide of all the inexperienced in tropical diseases, and the results may be inferred from the statement made to me by an inspector of hospitals, when I was travelling within the tropics, in answer to my request to know his opinion of the treatment of the fevers of the country, that, for the first nine cases of fever he treated he prescribed blood-letting, relying on the confidently expressed results of the experience of the author of the work alluded to, and they all died; that he next tried large doses of calomel, but was not more successful; and that he lastly had recourse to cinchona (quinia was not then discovered), but he could not get it to remain on the stomach. I suggested to him that he would succeed better if he conjoined the bark with capsicum. He some time afterwards was himself a victim to this fever.

of all the secretions and excretions, and ultimately impair the vital cohesion of the tissues and the tone of the vascular system and of the capillary vessels, thereby occasioning effusions into serous cavities, and increased discharges from exhaling and secreting surfaces, and all the phenomena characterising the progress of the more malignant forms of this malady. — (*f.*) The most important parts of the pathological conditions of puerperal fever are the states of vital power and of vascular tone characterising the disease, inasmuch as these states, more than the seat and amount of local lesion, mark the kind and tendency of the malady, and either resist, or remarkably favour, the extension of the local changes. — (*g.*) According to the mode of operation of the exciting causes, or to the avenue by which these causes invade the frame, either the constitutional infection, or the local affection may be primary; but, whichever may be secondary, an aggravation of the primary disorder will be produced by it, the one re-acting upon and increasing the other until disorganisation and death result, if the procession of morbid actions be not arrested by agents capable of changing the states of vital power and vascular action, and of enabling them to resist further alterations, as well as to restore those which have already taken place. — (*h.*) A due recognition and estimation of the states of vital power and of vascular action are the basis on which a rational treatment of puerperal fevers should be placed, inasmuch as it is by means of agents affecting these especially that we are enabled to arrest the progress of the malady, and to resist the extension, and even to remove the effects, of the local disease.

261. X. TREATMENT. — It is obvious that, in order to be successful, the treatment of puerperal fevers should be appropriately assigned to each of its forms; and that, as these forms are characterised not only by different, or even opposite states of vital power and of vascular action — by very different pathological conditions, — so the treatment should be assigned accordingly. Has there appeared in the numerous works on puerperal fevers, or in the still more numerous productions on the diseases of females, either a due estimation of the different forms of these fevers, or a satisfactory exposition of the treatment suited to each form — supposing that the forms and states of these fevers are there duly set forth? Let the reader, who may be supposed to be excited by a desire to know as much as possible of the opinions of those who profess themselves to be experienced by attempting to instruct others, — of opinions of the greatest importance to the community, respecting, moreover, the most fatal disease known in this country, and that disease attacking only females in the most interesting and most important period of their existence, — refer to the works enumerated at the end of this article, and then let him answer not only the above question, but also the following two questions: — Have these numerous productions, which have appeared since the latter part of the last century, advanced our knowledge of the pathology and treatment of these fevers in any important particular, or in any way excepting as respects a few subordinate details? Have certain remedial measures, confidently recommended many years ago by physicians possessed of experience, and capable, by ability and education, of observing and of reasoning with at least an average degree of accuracy, been satisfactorily tested, or adopted, or at all appropriately employed, in those institutions, which are most notorious for the generation of these maladies? Leaving these questions to be answered by those whom they may concern, and suppressing those painful and humiliating reflections which the subject suggests to the minds of those even partially informed as to its ethical as well as therapeutical relations, I proceed, *first*, to consider the treatment which my experience has shown me to be most appropriate to the different forms and states of puerperal fever, and *next* to notice the several methods and means advised by other writers, and the value which I believe to be attached to them.

262. *A.* THE INFLAMMATORY FORM OF PUERPERAL FEVER, in its more sthenic manifestations, whether commencing as *puerperal peritonitis*, or *hysteritis*, or as *metro-peritonitis*, requires the prompt and decided antiphlogistic treatment recommended for inflammations of the PERITONEUM (§§ 137, *et seq.*) and of the UTERUS, with a due consideration of previous sanguineous losses or exhaustion of the patient, of the state of her constitution, and of the several circumstances and symptoms connected with the case. It should not be overlooked, that all cases of these inflammatory states of the disease are not possessed of an equal amount of sthenic diathesis; but that, owing to the nature of the causes, and to the constitution or previous state of the patient, the febrile disturbance as well as the local affection may approach nearer the asthenic than the sthenic condition, and thus the synochoid or intermediate grade of the malady be nearly approached, if not altogether reached. In these states it may be a matter of doubt as to the extent to which vascular depletions, either general or local, ought to be carried; or, if they have been already employed, as to the propriety of repeating them. In these circumstances, and especially in large towns, or in a vitiated atmosphere, less risk will accrue from the rational adoption of other measures, — from a due recourse to calomel and opium, conjoined, in the more asthenic cases, with camphor, to terebinthinate embrocations or fomentations, and to the other means recommended for *peritonitis* (see PERITONEUM, §§ 138—143.), than from large or frequent bleedings. When the disease commences in the uterus, in the form either of *hysteritis*, or of *metro-peritonitis*, or in the uterine appendages, as *ovaritis*, too large depletions may only favour the extension of the inflammatory action, unless the *sthenic* diathesis exist, or the patient be not remarkably exhausted by previous losses or inanition. When the local affection assumes an *asthenic* character, the most appropriate treatment is that which I have advised for the asthenic form of peritonitis (see *art.* PERITONEUM, § 150.), and which is equally suited to the other prominent affections appearing in this and in the synochoid forms of the malady.

263. *B.* THE SYNOCHOID OR INTERMEDIATE FORMS OF PUERPERAL FEVER, however commencing — in whatever organ or structure, as fully set forth (§ 185, *et seq.*) — require a treatment which should have strict reference to the states of vital power and vascular action — to the predominance of either the sthenic or asthenic diathesis; for, however obvious may be the local seat of mischief, the treatment is not materially or at all different as respects the local affection, especially

at an early stage, or until the disease is far advanced. In this form of the disease especially when commencing with rigors, the early re-action associating the local disease assumes more or less of a sthenic, or inflammatory character, which, however, soon passes into the asthenic, especially when the patient breathes a close or impure air, or is morally or physically depressed; or when the veins are more especially affected. In many cases of this form, vascular action is often attended by great irritation or excitement, and by an expansive or open state of the pulse, indicating an alteration in the state of the blood, both in quality and in quantity—in quantity especially as relates to the capacity of the vascular system, and to the power of adjusting itself to the quantity of blood contained,—and in these, *vascular depletions* are often injurious, whether general or local; and although in some instances a small or a local bleeding may be of service, yet if it at all pass a very moderate amount, the most irreparable mischief may ensue. In this form of the malady, the inflammatory states of the parts so generally complicating it, if not altogether asthenic at the commencement, soon passes into this condition, especially when the treatment is calculated to lower the powers of vital resistance; and, as vascular depletions not merely possess this property, especially with females confined in lying-in wards, or in the close and impure air of large towns, &c. but also remarkably favour the imbibition and absorption of the discharge retained in the uterus and sexual passages, the occurrence of uterine phlebitis or lymphangeitis, and contamination of the circulating fluids, they are most liable to be injurious, and they ought to be most cautiously and moderately prescribed.

264. *a.* A large proportion of the cases of this form of puerperal fever originates in imperfect contraction of the uterus, owing to deficiency of vital power—or to the vital depression more immediately following the impression of the infectious or poisonous cause; the imperfect contractions favouring the retention of an unusually large quantity of lochia within the cavity of the organ and in the vagina, followed by changes in this discharge of a septic and contaminating nature. Thus altered, the lochia not merely affects the surfaces with which it is in contact, but is also imbibed by the vessels, inflaming or irritating them, and altering the blood. With the view of enabling the uterus to throw off the coagula and fluid which may be retained in it, I have advised, in cases where the contraction of the organ after delivery appears to be weak or imperfect, those remedies which are most calculated to produce or to promote a tonic or contractile action of the womb. With this intention I have directed the early application of the infant to the breast; and, if the uterus fails to contract sufficiently, an occasional dose of the biborate of soda, or of ergot of rye, or an enema containing spirits of turpentine with assafœtida. When, therefore, the disease commences thus locally, the cause is, owing to the circumstances just stated, more or less septic or contaminating, although the vascular reaction may be considerable, when the strength and habit of body of the patient is capable of developing it; and the local effect produced by this cause is generally of a diffusive kind. Admitting that the effect produced locally by this cause, or by any other calculated to occasion it, is of an inflammatory nature, the question still remains, Is the inflammation of a sthenic or asthenic nature, or to what amount may it be supposed possessed of either of these characters? That it is not purely sthenic inflammation of the parts is shown by the state of the pulse and other constitutional symptoms, and especially by the rapid extension and consequences of the local mischief; and that it is either wholly asthenic or largely possessed of this property is proved by the constitutional disturbance, by the rapid diffusion of the local affection, and by the products of such affection. As it has been demonstrated by JOHN HUNTER, and confirmed by all subsequent observers, that asthenic or diffusive inflammations, and inflammations of circulating vessels, are not arrested or even mitigated by general vascular depletions, and hardly even by local depletions, but that they are aggravated in their most distinctive characters and consequences by this treatment, more especially by venæsection, it is a matter of the utmost importance that some other than this most abused means should be resorted to. Cases, however, may occur where a nearer approach to sthenic inflammatory action; and a more robust and plethoric state of the patient may warrant a recourse to a moderate depletion—locally in preference, and early in the attack, especially when it is followed by the remedies about to be mentioned; but cautious observation and experience should direct this measure, too often recklessly prescribed by the insufficiently informed, or by the followers of worthless authorities, not a few of which have appeared in recent times.

265. Whether this form of the disease originate in the uterus or uterine vessels, or in the uterine appendages, or in the peritoneum, as shown both here and in other places, to be probably the case in many instances; or whether it proceed from a constitutional infection, received through the avenue of the respiratory organs, the local affection or affections being secondary or contingent, as contended for in respect of other instances (§§ 245, *et seq.*), there is certainly no remedy so efficacious as a decided and judicious use of *spirit of turpentine*. This medicine was first employed for this disease by Dr. BRENAN, of Dublin; and although it has been "damned by faint praise" by subsequent writers, who either have not had recourse to it, or have employed it insufficiently or injudiciously, I can assert that it is the most efficacious remedy that can be employed in this form of puerperal fever. I state this from a lengthened and diversified experience of this substance in disease; and yet in England, I know not of any other physician than myself who has given it a satisfactory trial in puerperal fever, even up to the present day. I state this in order that the remark may be disproved as regards the knowledge of others, and that I may be enabled to record the fact. The chief hindrances to the employment of this substance are—1st. A mistaken view of the nature and consequences of its operation;—2d. Its nauseous or unpleasant effects;—and 3d. The opinion that it cannot be retained by the stomach when nausea and vomiting are complained of. As to the *first* of these I can assert, that it is, according to the mode of its exhibition, antiphlogistic in acute inflammations, and more efficacious in arresting the progress and consequences of asthenic

or diffusive inflammations, than any other substance; whilst it possesses the property of accommodating, by its tonic and astringent operation, the vascular and capillary system to the state and amount of its contents, of lowering the frequency of the pulse, and of restraining effusion from serous and mucous surfaces. That it is unpleasant, and that it is sometimes thrown off the stomach, I admit; but, in many such cases, it is beneficial nevertheless, its emetic action, independently of the impression produced by it on a vital organ, occasionally being of service, and even actually required. In those cases where the irritability of the stomach is even the greatest, it not only is the most easily retained, but is actually the most efficient remedy for the removal of the irritability, which, in the opinion of many, is the chief reason against a recourse to it. But the exhibition of it by the mouth is often not the only, and sometimes not the most, beneficial way of prescribing it; for it may also be administered in enemata, or applied externally and occasionally, according to the nature of the case, even more efficaciously than in any other mode.

266. Although the spirit of turpentine may be more efficaciously employed in this form of puerperal fever than in the more sthenically inflammatory or in the malignant, still it is a valuble remedy also in both these extreme forms, — in the inflammatory after sufficient vascular depletions, aided by other means, as described when treating of *inflammations of the* PERITONEUM (§§ 141, *et seq.*); and in the malignant, as will be shown hereafter. In this, the intermediate state of the malady, whether commencing locally or with a constitutional infection, this remedy is most beneficial when employed early, or before effusion into serous cavities, or softening or disorganisation of the tissues has made much progress. In this, as well as in other forms of the malady, success depends upon a prompt recourse to treatment. If even a few hours elapse from the invasion, changes beyond the reach of remedies may have already supervened. If the symptoms and circumstances of the case, and especially the state of the pulse, indicate the propriety of a small or moderate venæsection, or of local depletion, this should be immediately adopted; if the latter mode of depletion be preferred, a number of leeches, varying with the peculiarities of the case, may be applied near the seat of tenderness and pain; and when they come away, flannels wrung out of hot water, and freely sprinkled with spirits of turpentine, should be applied over the abdomen, and covered by oiled silk or by a napkin; or the spongio-piline may be employed instead of these; and contemporaneously with the application of leeches, a full dose of calomel, camphor, and opium — (calomel gr. v—viij.; camphor gr. iii—vj.; and opium gr. ij.) — ought to be given. A few hours after this medicine has been taken, about half an ounce of spirit of turpentine, and, if the bowels are not freely open, an equal quantity of castor oil, should be taken on the surface of an aromatic water, or on spearmint water, or on milk, or in a cup of cold coffee. In most instances the intention is not so much to evacuate the bowels, for they are often sufficiently open, as it is to exhibit a remedy which is calculated, by its passage into the circulation, at least partially to resist the changes taking place in the blood and vascular system generally; and, at the same time, to procure the discharge, both from the bowels and from the uterus, of such morbid matters as would be inevitably most injurious if retained even for a short period. In prosecution of this intention, therefore, an enema containing spirits of turpentine should also be administered some hours afterwards; the quantity of this substance, the medicines conjoined with it, and the time of having recourse to it, depending upon the peculiarities of the case. If the bowels are too frequently acted upon, castor oil should not be conjoined with it, either when taken by the mouth, or administered in a clyster; but olive oil may be substituted. Indeed, the latter may be very advantageously given with the spirit of turpentine in almost every state of the disease; for if the bowels should be too relaxed, the compound tincture of camphor or laudanum, or syrup of poppies, may be added; and emollients or demulcents may be made the vehicles for its administration, with olive oil, in enemata. The repetition of these medicines, of the turpentine more especially, the quantity of each, and their combinations, must necessarily depend upon the acumen and experience of the physician, upon the appropriate use of them, and upon the effects produced. But, with their internal employment — by the mouth or in clysters — a recourse to the turpentine embrocations or stupes should be persisted in as long as tenderness, pain, or distension in any part of the abdomen is complained of; and the above dose of turpentine should not be given by the mouth oftener than twice or thrice at the most.

267. If the urinary organs should become affected, either by the quantity of turpentine prescribed, or by its retention by the alimentary canal, the effects will soon disappear if demulcents are freely exhibited; and, if much depression be experienced, either from the operation of this medicine or the state and period of the malady, restoratives, such as quinine with camphor and capsicum, or wine taken in Seltzer water, or opium conjoined with aromatic stimulants, &c., may be administered, according to the state or urgency of the case.

268. *b. Metro-phlebitis* is one of the most frequent complications of this form of puerperal fever, although it is rarely recognised at an early stage. But, if recognised, should the treatment be different from that now recommended for the arrest of this serious state of the malady? I believe that no other plan of cure will be found more beneficial for it than that now advised; that no other than powerfully restorative, tonic, and soothing means will be found beneficial in this form of phlebitis, or, indeed, in any other form. Dr. R. LEE, who has attached so much importance to metro-phlebitis as a pathological condition of puerperal fever, adds nothing to the treatment of this condition, and is even unaware of the means recommended, with great propriety, and often with great success, by JOHN HUNTER in cases of phlebitis. Dr. LEE gives us no further information on this topic than to profess his want of confidence in the use of mercury for this state of the malady. HUNTER's treatment of phlebitis was powerfully tonic, stimulant, and restorative, and he directed it with the view — correct both in pathology and in therapeutics — of enabling

the vessels of the diseased part to throw out lymph capable of coagulation, and of assisting the powers of life, by these or other means, to resist the progress and to retrieve the consequences of the disease. Of the use of oil of turpentine in this malady, Dr. R. LEE entertains a most unjust opinion. I question much the fact of his having given it a satisfactory trial. He distrusts the evidence furnished by Dr. BRENAN's cases, is not convinced that the lives of those to whom it was administered were saved by it, and says that he has seen many recover without turpentine, in whom the symptoms were more unfavourable than in the cases described by Dr. BRENAN; and that he has seen other patients in whom the disease appeared to be aggravated by its use. Now it would have been most desirable if Dr. LEE had favoured his readers with an exposition of the treatment which was so fortunate as to restore many cases, in which the symptoms were more unfavourable than in those described by Dr. BRENAN, seeing that in those turpentine had not been used; "sed de non apparentibus et non existentibus eadem est ratio." Having myself since 1815 prescribed this substance in numerous diseases, malignant, febrile, and inflammatory, and having for many years — since about the above period — employed it in puerperal diseases, I have been induced to make inquiries respecting its use by other physicians; and yet, notwithstanding the notoriety of the practice, and its undoubted success if duly and appropriately prescribed, I have not heard of its having been employed by any other physician in this metropolis besides myself. This is somewhat singular, when the general fatality of the disease, and the highly favourable reports of the practice which have been made by Dr. BRENAN, Dr. DOUGLAS, and myself, are considered. What are the obstetric practitioners, who appropriate the treatment of puerperal diseases, about? Should the obstetrician cease to be physician, in respect of liberality and candour of sentiment, and of a due appreciation and adoption of remedies recommended by others?

269. Let the opinion given by Dr. DOUGLAS, in an excellent memoir on puerperal fever, be the answer to this question, as regards the remedy in question. He states that, in the epidemical and contagious puerperal fever, ʒiij of the turpentine should be given, with an equal quantity of syrup, and ʒvj of water, three or four hours after the first dose of calomel; and that after an hour this should be followed by an ounce of castor oil, or some other purgative; or the turpentine and castor oil may be given together; and he restricts the internal use of turpentine to twice only. I have, however, given it even in a larger dose — in half an ounce — thrice in the same case, besides administering it in enemata and externally, with complete success; although I have found one or two doses more generally sufficient. "The external application of turpentine," he adds, "without either its internal use, or the aid of blood-letting, I have frequently experienced to be entirely efficacious in curing puerperal attacks; and although I have hitherto omitted to speak of turpentine for the cure of the other varieties of this disease, yet I should not feel as if I were doing justice to the community if I did not decidedly state, that I consider it, when judiciously administered, more generally suitable, and more effectually remedial, than any other medicine yet proposed. I can safely aver, I have seen women recover, apparently by its influence, from an almost hopeless condition, certainly after every hope of recovery under ordinary treatment had been relinquished." — (*Dubl. Hosp. Rep.* vol. iii. p. 157.)

270. Now, without referring to my own experience and authority in the matter, and to the statements of that experience which have appeared in various quarters, I may remark that Dr. BRENAN's publication was in 1814, and Dr. DOUGLAS's statement, now quoted, was made in 1822; and yet, unless in those cases for which I prescribed this remedy in Queen Charlotte's Lying-in Hospital, I am not acquainted with any sufficient trial which has been made of turpentine in any of the lying-in wards of this city. The eminent senior physician to the General Lying-in Hospital, writing in 1839, remarks as follows: — "I have no experience of the use of this remedy (turpentine) introduced by Dr. BRENAN in 1814, and praised by Dr. DOUGLAS of Dublin, and KINNEIR of Edinburgh, in puerperal fever."

271. *C.* THE MALIGNANT OR PUTRO-ADYNAMIC FORM OF PUERPERAL FEVER (§§ 198, *et seq.*), if not recognised at its commencement, and promptly treated, is always fatal. If even a few hours elapse from its seizure, the changes which have already taken place in the fluids, and even in the vital cohesion of the structures, are rarely arrested in their onward course by any treatment. The means of cure should therefore be early, promptly, and decidedly employed. When thus prescribed they are generally efficacious — at least they proved so in several outbreaks of this form of the malady in Queen Charlotte's Lying-in Hospital, especially when I had the advantage of the assistance of an intelligent resident pupil. In one of the most severe of these epidemics I had the aid of Dr. VOWELES, an intelligent and well-educated young physician, who was constant in his attendance, and who, immediately upon an attack, had recourse to the treatment about to be recommended, varying it according to my directions with the peculiarities of the case and the effects produced by the early part of it. On this occasion almost every case recovered. When I was first called upon to prescribe for this disease in the hospital, the most malignant form prevailed, and every case that had occurred had terminated fatally. I first had recourse to DOULCET's plan of giving emetics, but it failed, probably owing to my being called at an advanced period of the disease. Having frequently employed the spirit of turpentine in the more malignant states of fever, and being aware of Dr. BRENAN's recommendation of it for this malady, I next prescribed this substance, both by the mouth and in enemata, trusting to it principally; but without obtaining from it all the advantages which I had expected. It should, however, be stated, that frequently I was not called to a case until it was far advanced. I was next induced, by my experience of the effects of large doses of calomel and opium in some acute diseases, to try the effects of these; but they still more signally failed. I afterwards had recourse to both modes of treatment, and prescribed, every four, five, or six hours, a large dose of calomel and opium, and the spirit of turpentine with castor oil; the turpentine being employed both internally and

externally. From this practice more success accrued than from either of the plans adopted singly. Yet as the success did not equal my wishes, and reflecting upon the phenomena, pathological conditions, and structural changes of the disease, I resolved upon trying the effects of camphor, in large doses, in conjunction with calomel and opium, and sometimes with opium alone, or with quinine and capsicum, omitting the calomel, aided by the turpentine, in the manner about to be stated, and upon preceding these by an emetic when its use was indicated by the symptoms.

272. Immediately upon the accession of the disease, or as soon afterwards as possible, from ten to twenty grains of calomel, from eight to sixteen grains of camphor, and from one to three grains of opium, were administered in the form of bolus, with conserve of roses, the quantities of these medicines thus varying with the apparent severity of the case, and the state of the pulse. In some instances, when vital depression was extreme, or the disease farther advanced, the camphor was conjoined with capsicum and opium, and occasionally either with ammonia or with sulphate of quinine, the calomel being omitted. The above were the extreme doses of the camphor, calomel, and opium; and when the largest quantities were given, five or six hours were allowed to elapse before they were repeated. If smaller doses were given, three or four hours only were sometimes allowed to pass. Soon after the second exhibition of these medicines, about half-an-ounce of spirit of turpentine, with or without castor-oil, according to the state of the bowels, was taken as above directed; and a few hours afterwards a larger quantity was administered in an enema, with castor-oil or with assafœtida, and demulcents or emollients, as circumstances suggested. The intention was to make a strong impression on the constitution by means calculated to arrest the morbid action, and to counteract the changes taking place in the blood. Very soon after the development of the abdominal symptoms, especially the pain, distension, and tenderness, several folds of flannel, sufficient to cover the whole abdomen, were directed to be wrung as dry as possible out of hot water, sprinkled very freely with turpentine, and applied as already described. This application was renewed at intervals, if the progress and symptoms of the case required a recourse to it.

273. In two or three hours after the treatment had advanced thus far — or after one or two of the boluses had been taken, and one dose of the turpentine and an enema administered — the symptoms had generally much abated, if these means had been early employed. In this case, the doses of the camphor, calomel, and opium, or of the other combinations of which the bolus was composed, were diminished, and wine also given at the longest intervals above mentioned. The turpentine draught was seldom prescribed oftener than twice, and one only was taken in the twenty-four hours. It sometimes also contained an aromatic spice, as capsicum, &c. If the enema was soon thrown off, another was sometimes administered a few hours afterwards, and the fomentation was renewed. If the malady resisted the first or second doses of these substances, the bolus was repeated a third and sometimes a fourth time, after the longer intervals, and, in a few instances, a third dose of the turpentine was ordered; or the enema containing it was repeated and conjoined with other medicines according to the state of the bowels. If vital depression was extreme, the turpentine was given in small doses or withdrawn, and capsicum, or carbonate of ammonia, was taken in the bolus, instead of the calomel; and a dose of decoction of cinchona, with chlorate of potash, carbonate of soda, and the compound tincture of cinchona or tincture of serpentaria, was ordered in the intervals. If the lochia were very offensive, injections containing the solution of chlorinated soda were employed; and the same solution, or a solution of chloride of lime, was used in the wards.

274. If the symptoms evinced marked biliary disturbance or congestion, and the other indications for the exhibition of an *emetic* were present (§ 278.), fifteen grains of ipecacuanha were given immediately and previously to the first dose of calomel, camphor and opium; and the free operation of the emetic was promoted by the repetition of the same dose in an hour, and by the infusion of chamomile flowers. The emetic generally procured the early evacuation of much altered bile, both by the stomach and by the bowels, and also caused a copious sweat, which the camphor and opium further promoted, and the terebinthinate embrocations on the abdomen tended to encourage and to perpetuate. But of the use of emetics in these cases, I shall take further notice in the sequel (§ 278.).

275. When the above treatment was employed early, or before either effusion into the peritoneal cavity or other structural change had supervened or made any considerable progress, it was generally successful both in preventing or arresting these changes, and in resisting further alterations of the blood, as well as in removing such as may have already taken place, by increasing the depurating actions of the several excreting organs. The successful employment of the above means required the constant attendance of an intelligent assistant as well as the frequent visits of the physician. During the prevalence of the disease I visited the cases three or four times in the day, directing the repetition, succession, or modification of the above remedies according to their effects or to circumstances. If beneficial results did not follow after a very few doses — after the repetitions of the medicines as now stated, — or if they did not appear in from twenty-four to forty-eight hours after their first exhibition, the patient rarely recovered. In some extremely malignant cases, for which I did not consider the calomel to be indicated, as well as in others which I did not see sufficiently early, I prescribed camphor in large doses with capsicum and moderate doses of opium, and sometimes also in conjunction with the sulphate of quinia, which, at the time of the occurrence of these worst cases, was coming into frequent use. In some of these very hopeless cases, these means, aided by an occasional dose of turpentine, given either by the mouth or in an enema, and by the external application of this substance, proved almost unexpectedly successful. In others, however, a temporary check only appeared to be given to the disease, the duration of this improvement being seldom longer than a few hours; these cases suggesting the conviction that the changes observed after death had advanced too far to be removed by the agents employed in

medical practice. Of the other means which were occasionally tried in this and the preceding varieties of the disease, mention will be made in the sequel.

276. *B.* REMARKS ON SEVERAL MEANS OF CURE, &c. In many of the works which have appeared on puerperal fevers, some particular remedy or method of cure has been recommended, empirically rather than conformably with rational views of the pathology of these diseases; and, in most of these, the treatment, which seemed, in the eyes of those recommending it, successful to an extent which satisfied their expectations, was lauded as altogether applicable to all appearances of these maladies which may hereafter occur. But whilst each held forth his own method as most worthy of adoption, other methods which had been equally praised, by equally sanguine predecessors, met with little approbation, if indeed they escaped a complete condemnation. It would neither be gracious nor profitable to trace the various differences of opinion as to the treatment of these diseases to their sources; for some of them may be referred to those imperfections of our nature, which medical practice is calculated to develope and to foster when not directed and elevated, in its ethical relations, by the higher and more generous sentiments; whilst others may appertain to the very different forms of these maladies, in different occasions, circumstances, and epidemic constitutions. With no marked disposition to be sceptical on the one hand, or to be credulous on the other,—not disposed, with saintly faith, to place much confidence in that which I cannot explain, or to believe in what appears impossible—still I cannot attempt to set limits to the operations of nature, or to the influence of mind and its numerous manifestations on the vital actions. What may appear now as at least improbable, may hereafter be found to be entirely in agreement with some principle hitherto concealed from our superficial knowledge. The unknown may seem difficult, complex, unfathomable, and even unattainable, but once known it may be easy, simple, obvious, and within the reach of every intellect. The malady which is found to-day fatal, malignant, and pestilential, may be proved to-morrow to be possessed of these properties only in virtue of our ignorance, and of our endeavours to encounter a formidable calamity by complex and ill-understood means; simpler agents, promptly and efficiently applied, accomplishing the ends, with a direct and beautiful simplicity, which were attempted, under the delusions of "false science," by multiplied and inappropriate measures and jarring influences.

277. *a. Vascular depletions and other antiphlogistic measures* were advised for these fevers at an early stage by HULME, KIRKLAND, GORDON, HORN, ARMSTRONG, CAMPBELL, MACINTOSH, and others; and, whilst some carried these depletions to a great extent, others recommended greater circumspection; whilst a still greater number of writers prescribed very different or opposite measures. All were equally sincere, and all equally erred—all applied, as true of the genus, what was true only of the species. For, as I have shown above, there are *sthenic* inflammatory, *asthenic* inflammatory, and *malignant* or putrid, states or forms of the malady, this last state having no inflammatory attribute whatever, and to each of these different or opposite means are requisite. In the *first* of these, venæsection, carried to an amount which can be truly assigned only by the closely observing physician, to the peculiar circumstances of each case, is absolutely necessary; in the *second* of these forms, local depletions, by a number of leeches, are only contingently required, and often then with a caution, which should never be laid aside; and in the *third*, vascular depletions of any kind are certain agents of destruction. Thus, the different forms of the malady, depending upon very different states of vital power, of vascular action, and of constitutional disturbance—upon different pathological conditions—occurring at different periods and in peculiar circumstances, required very dissimilar methods of cure, the method which is quite appropriate to the one form being inappropriate to the others; the great error of writers being their recommendations of what they found most beneficial in their limited sphere of observation, and in the short period of their experience, for all other outbreaks or manifestations of these fevers, without reference to form, character, or epidemical constitution. There is one circumstance connected with the employment of leeches in the more asthenic states of this malady which should always be kept in recollection; namely, the difficulty of arresting the hæmorrhage from them owing to the states of the blood and the impaired tone of the capillaries and tissues. Many years ago, when all cases of this disease, under the delusions created by those who, in the fulness of their ignorance, rushed into reckless print, were treated by bleeding of some kind or other, a large number of leeches were applied over the abdomen of a patient, and, upon these falling off, were followed by a warm fomentation. When this fomentation was looked to after a time, she was found lying dead in a pool of blood. In another case, which occurred in the hospital, leeches were prescribed by one of my colleagues, and the night nurse who was left to attend to them fell asleep; and although no long period could have elapsed the patient was found dead when she awoke. These facts prove not only the risk of copious hæmorrhage from leech-bites in certain states of the disease, but also the impropriety of having recourse to them in these states, when even a small loss of blood may occasion fatal sinking.

278. *b. Emetics* had at one time a great reputation in the disease, and have received the commendations of WILLIS, WHITE, DOULCET, BANG, LENTIN, WALSH, LE ROY, HUFELAND, OSIANDER, and DESORMEAUX; whilst KIRKLAND, HORN, R. LEE, and many others are opposed to the exhibition of them. Ipecacuanha has generally been preferred as the emetic substance, and is certainly most deserving of adoption whenever a trial of this practice may be determined upon, although it may be conjoined with other substances. Amongst the experienced writers favourable to ipecacuanha emetics, DOULCET is most distinguished. Observing in 1782 that the disease often commenced with vomiting, he viewed this as an indication of nature, and he assisted her efforts by giving fifteen grains of ipecacuanha, which were repeated the next day. "The patient recovered. This unexpected success led him to try it on all the rest, and two hundred were saved, while six, who refused to take the emetic, died.

This treatment, when methodised, consisted in giving fifteen grains of ipecacuanha, repeated in an hour. The last dose acted generally on the bowels, an action which he sustained by a potion, consisting of olei amygdal. ʒij; syrupi malvæ, ℥j; kermes mineral, gr. j. M.; a table-spoonful of which was taken every two or three hours. He repeated the emetic the next morning if the symptoms were alleviated, and the rather if they were not. If the belly remained meteorised and painful for several days, he looked upon it as a reason for persevering. The previous devastation of the malady, and the consequent despondency in the practitioners of France, caused the news of DOULCET's success to be hailed with enthusiasm throughout the kingdom. The government compensated the discoverer largely. The Faculty of Medicine drew up minute instructions for this mode of treatment, and distributed gratuitously over the whole of France. On the following year the malady was once more epidemic, and the remedy of DOULCET resorted to, in full and earnest faith, but this time it was quite unsuccessful." Dr. FERGUSON, from whose work I have now quoted, justly remarks that the failure arose from want of discrimination between the varieties of this malady, and from applying in all cases that which is useful only in some. The evidence in favour of emetics is quite as great as that for bleeding or mercury; and it is not supported merely by DOULCET's remarkable success, but by the experience also of RICHTER, CRUVEILHIER, TONNELLÉ, and DESORMEAUX. The question is, however, *What are the cases to which this remedy is applicable?* When there are nausea and vomiting on the accession of the disease; when there is bilious vomiting or diarrhœa, with bilious or dusky suffusion of the skin, or signs of congestion of the liver; when the upper regions of the abdomen are the earliest or chief regions affected; when the invasion of the attack is unattended by rigors; and when the disease presents more of the malignant than of the inflammatory or synochoid characters, then the early exhibition of an ipecacuanha emetic has proved most serviceable. On the other hand, when the painful symptoms appeared in the hypogastrium, or when the pain and distress of the abdomen were aggravated by vomiting; when the disease had advanced; and when signs of effusion into the peritoneal cavity had appeared, emetics were manifestly contraindicated and were not prescribed. In a few of the most malignant cases which I treated, I prescribed, previously to other means, when the patient was seen at the commencement of the seizure, a full dose of sulphate of zinc with powdered capsicum, in order to procure a more immediate operation, and to prevent any contingent depression, which I dreaded from the use of ipecacuanha. This last substance, I sometimes gave also thus combined. I remarked, however, that when the ipecacuanha was thus combined, the emetic effect was liable to be prevented by the capsicum, whilst the operation on the bowels and skin was evidently increased by it.

279. Dr. FERGUSON, in his very instructive work, remarks as follows upon this important part of the treatment of this most dangerous malady: — "Besides the examples of the utility of emetics afforded by TONNELLÉ, I have been informed by my friend Dr. R. MAUNOIR, that his father, the celebrated MAUNOIR of Genève, looks on ipecacuanha as the remedy most to be relied upon in the treatment of puerperal fever, — a faith founded on repeated experience in an extensive practice. Among the older authors, WILLIS, WHITE, and A. PETIT were advocates for its employment. In our own times, OSIANDER and HUFELAND in Germany; RECAMIER, CLIET, TONNELLÉ, and DESORMEAUX in France, have all borne their testimony to the signal benefits to be derived from the use of ipecacuanha as an emetic. It would appear that some seasons, or some portions of the year, are more favourable for its exhibition than others. DESORMEAUX first tried emetics in the end of 1828, with great success. During the greater part of the following year they failed; but their use did not aggravate the symptoms. In September, 1829, being cold and humid, they were again given with great benefit. Towards the end of October they lost their power, and in November were totally useless. When it is considered that puerperal fevers are often cured, or alleviated, by copious spontaneous perspiration, or by purging and vomiting, we ought not to wonder at the success of an agent like ipecacuanha, which is capable of producing, and usually does produce, all these effects at once." (*Op. cit.* p. 210.)

280. *c. Purgatives* have been recommended by HULME, SELLE, WHITE, DENMAN, STOLL, AASKOW, LEAKE, BUTLER, HEY, CHAUSSIER, and others. Dr. FERGUSON states that CEDERSKIÖL, a Swedish physician, tried them extensively, and concluded that the more drastic purgatives are prejudicial. This is also the opinion of BAGLIVI and JOHN CLARKE. The treatment which I have advised above almost precludes the necessity of having recourse to any other purgative medicines than those comprised in the above plan. For the large doses of calomel, sometimes preceded by an emetic, and the subsequent recourse to turpentine and olive or castor oil, and to enemata containing the same substances, as circumstances may require, are sufficient to answer all intentions as to biliary and fæcal evacuations, and to produce at the same time an impression on the economy calculated to arrest the progress of the malady, and to augment the functions of the several emunctories. Dr. FERGUSON justly remarks, that in the wielding of this remedy, as of every other useful one, the disputants have each tacitly assumed the universal similarity of all puerperal fevers, — an assumption, I may add, which has been fatal to thousands. His own experience with regard to purgatives is, that whenever they create tormina, there is the greatest risk of an attack of metro-peritonitis succeeding. In order to avoid this, he invariably mixes some anodyne — usually DOVER's powder, or hyoscyamus, or hop — with the purgative.

281. *d. Mercurials* in various states of combination and modes of administration have been advised for puerperal fevers. Calomel, however, is the preparation generally preferred, and is usually conjoined with opium, as recommended by HAMILTON, and subsequently by WOLFF, HUFELAND, and many others. The inunction of strong mercurial ointment over the abdomen has been suggested by GEBEL and J. DAVIES, who have likewise advised the weaker ointment to be applied over the blistered surface of the belly.

But the larger doses of calomel, as I have employed them above, appear to me most deserving of adoption; for it is not so much from the specific action of this medicine that benefit is to be expected, in many cases, as from the operation of it on the biliary organs, and secretions and excretions generally — by its depurating action on the blood, through the medium of the liver and of the other excreting organs. It should not, however, be inferred that calomel or other mercurials are equally beneficial in all the forms of this malady. They, especially calomel, are most serviceable in the inflammatory varieties — in the sthenic after blood-letting, in the asthenic after local depletions, or after an emetic. In the malignant form of the malady, calomel was most serviceable at an early stage, conjoined with stimulants and opium; and was employed chiefly with the view of increasing the actions of the liver and other emunctories. It was often followed by powerful tonics and restoratives. If the large doses of calomel failed early in the disease, they were seldom of any advantage at an advanced stage, although this substance was given subsequently in smaller quantities. When the bowels are irritable, Dr. FERGUSON recommends the abdomen to be kept constantly covered with the linimentum hydrargyri compositum. He agrees with Sir B. BRODIE in considering the bi-chloride of mercury to be preferable when the disease is presumed to be connected with uterine phlebitis; and in this complication the bi-chloride may be conjoined with camphor and opium, or taken in a decoction of cinchona, as I have given it in several analogous pathological conditions.

282. *e. Opium* has long possessed considerable reputation in the treatment of puerperal fevers and peritoneal inflammations. (See *art.* PERITONEUM, § 150—153.) For the former, it has been much confided in by GEBEL, HOLST, HORN, MICHAELIS, BATES, &c.; for the latter, by HAMILTON, ARMSTRONG, GRAVES, STOKES, BATES, and others. It has been variously combined with other medicines for these states of disease — with calomel, or with antimonials, or JAMES's powder, or with ipecacuanha, or with musk, or with camphor, or with valerian, or with capsicum, &c., according to the views of the physician and circumstances of the case. The influence of opium in these maladies has been very justly estimated by Dr. WATSON, who truly remarks — "Of the great value of this remedy in certain cases, and after sufficient bloodletting (in the treatment of inflammations), I have long been satisfied. I presume its beneficial operation is to be explained by its known power of tranquillising disturbed and uneasy nerves. Mere nervous irritation appears sometimes to keep alive or to rekindle inflammation, which depletion of the blood-vessels had almost or for a time extinguished; and opium, given in a full dose, will often prevent this renewal of disturbance in the vascular system, by quieting the nervous irritability. I am, indeed, persuaded that opium is, of itself, equal to the cure of some forms of inflammatory disease, in which bleeding would be improper; the disorder of the capillary vessels subsiding spontaneously, as soon as the teased and teasing condition of the nervous system is allayed. Accordingly, the opiate treatment has been found the most effectual in persons who possess by nature, or who have acquired through disease or intemperance, undue irritability of frame. It is especially useful, also, whenever local inflammation is attended by much bodily pain, which in all persons is a source of irritation." It is most satisfactory to me to find my views, as to the pathology and treatment of INFLAMMATION (§§ 7—9. and 206.), in accordance with those of so able and discriminating a physician as Dr. WATSON.

283. Mr. BATES, of Sudbury, confides chiefly in opium for the treatment of puerperal inflammations and fevers. According to *one plan*, which appears to be directed against the more inflammatory states of disease, he directs bleeding from the arm to about a pint, except there be great exhaustion; and an opiate enema, consisting of ʒj to ʒij of tinctura opii in ℥xij decocti amyli calefacti, to be repeated in twelve hours, if there be no return of pain, and whenever there is a renewal of the symptoms. The patient is allowed only barley water or thin gruel, cold, and in small quantity. When the bowels are confined, and after the pain and sickness are removed, and the abdominal tenderness somewhat abated by the foregoing means, he prescribes the following clyster: — ℞. Vini aloes, ʒiij; magnesiæ sulphatis, ℥j ad ℥ij; olei olivæ, ʒj; aquæ calidæ, ℥xij. Misce. He further directs bottles of warm water to the feet; fomentations and linimentum saponis cum opio to the abdomen; and leeches when great tenderness is present. According to *another plan*, the following bolus is to be taken as soon as possible, and repeated in an hour, and then to be continued every two hours until the pain has ceased. Ease ensues, he says, from the administration of the fifth to that of the tenth bolus; if not, he resorts to the enemata. ℞. Pulveris opii, pulveris acaciæ, pulveris antimonialis, āā, gr. j; confectionis rosæ caninæ, q. s. Misce. Fiat Bolus.

284. *f. Stimulant, restorative, and even tonic remedies* have been recommended by several writers, and are more or less serviceable in the more malignant states and far advanced stages of the disease. I have very often had recourse to them; and almost always in conjunction with opium. The substances belonging to this category which I have most frequently prescribed are camphor, as directed above, capsicum, ammonia, and sulphate of quinine. Musk and valerian have likewise been advised, but commonly conjoined with opium, by HORN, MICHAELIS, and others. The ammoniated tincture of valerian I have found of service in some instances, variously conjoined with tincture of opium and other medicines, according to the peculiarities of the case. These stimulants and tonics are efficacious in the more malignant states of the disease only when given early, with full, large, or frequent doses of opium, in large doses, and aided by the turpentine, as prescribed above (§ 266.); and, after the second or third dose, I have not found any benefit derived from calomel, in these states of the disease, when repeated more frequently.

285. *g.* Of *other internal remedies* recommended for this malady but little notice is required. *Calumba* has been preferred by some writers when a tonic is required; and *alkalies* have been employed by BARKER and ALLAN. *Borax* has been given by BREFELD, BANG, and myself; and it is certainly of use, under certain circumstances,

especially in promoting the contractions of the uterus, and the discharge of coagula or retained matters from this organ; and thereby removing a cause of the disease, or an obvious source of aggravation and contamination. BOER attributed his success, in the treatment of an epidemic appearance of this malady, to his use of an antimonial preparation, which was without doubt the well-known JAMES's powder, which, when conjoined with opium, or with camphor and opium, is certainly extremely beneficial, and when prescribed after vascular depletions, in the inflammatory states of the malady, or when given from the commencement in the synochoid or intermediate form, so as to produce copious diaphoresis.

286. *h.* Of *clysters*, or *enemata*, it is unnecessary to add any thing to what I have already stated. The medicines which are most beneficial, when thus administered, are the spirit of turpentine, olive oil, castor oil, opium, camphor, assafœtida, &c., according to the form and stage of the disease.

287. *i.* *Injections into the vagina*, and even into the cavity of the uterus, have been recommended by several physicians, and by the author when the lochia is acrid, excoriating, and offensive. COLLINGWOOD, SCHMIDTMANN, DANCE, and TONNELLÉ have advised frequent injections of warm water only, or chiefly. I have seen benefit derived from the addition of a small quantity of one of the chlorides, or of crèasote, to the fluid, when the discharge was manifestly offensive. MICHAELIS directed vaginal injections, consisting of an infusion of valerian and linseed, and they were probably of service in washing away the morbid discharge, and in soothing the irritation of the sexual passages produced by it — the chief intentions which these means are calculated to accomplish.

288. *k.* It is hardly necessary to notice any other *external means of cure* besides those already mentioned. General warm *baths* and *hip-baths* have been directed by several writers; but there are several difficulties placed in the way of them; and in many of the most severe cases they are either of doubtful or of no advantage. Still they ought not to be entirely overlooked in the more inflammatory states of the malady, after depletions, and occasionally in other circumstances, which will suggest a recourse to them, but which hardly admit of description. The application of a *large blister* to the abdomen has received the approbation of GOODWIN, MICHAELIS, HUFELAND, and J. DAVIES, and is certainly deserving of adoption in several states of the disease; although a more immediate and decided advantage is derived from the turpentine stupes mentioned above (§ 266.), especially when early and perseveringly employed. If these cease to be of service, or are insufficient, or inappropriate to certain advanced states of the more prolonged cases, a blister will occasionally be of use.

289. *C.* PROPHYLACTIC MEASURES. — I have already noticed certain topics connected with the prevention of puerperal diseases generally (§ 43, *et seq.*); but there are others more especially relating to the prevention of puerperal fevers, that require a very brief notice. Prophylactic measures relate — 1st. To the management of the female during, and subsequently to, parturition; — and 2d. To the prevention of foul and contaminated air in the ward or apartment in which she is confined, and to the destruction and counteraction of these and all other infectious and contagious agents. — (*a.*) As to the former of these it is unnecessary to state more than that an officious interference with the parturient process, violent measures used to hasten it, or the neglect of means to promote it, when the efforts of nature are either insufficient or exhausted, the admission of a foul and contaminated air to the generative organs after parturition, or the retention of such an air or of foul exhalations in the vicinity of these organs, and neglect of due measures of cleanliness and of the frequent removal of the discharge, are calculated to cause or to favour an attack of this malady, and consequently that a careful avoidance of these causes should always be observed.

290. I quite agree with Dr. R. LEE that the administration of acrid cathartics soon after delivery should be avoided; and that the greatest care ought to be taken in performing the requisite operations of midwifery. The hand ought not to be passed into the cavity of the womb unless with the greatest gentleness, when the introduction of it is quite indispensable; and portions of the placenta should be prevented from remaining to become decomposed within the uterus. — "It is impossible to condemn too strongly the practice recommended by Dr. GOOCH, in cases of flooding after the expulsion of the placenta, of passing the hand into the uterus for the purpose of compressing the part where the placenta was attached, and from which the blood is flowing." — (*Op. cit.* p. 113.)

291. (*b.*) *The prevention of infection or contagion* in respect of puerperal fevers can be accomplished only by the adoption of those measures which I described when treating of INFECTION (see § 55, *et seq.*), and by the avoidance of those *causes* (§ 41, *et seq.*) which are productive of these fevers, as well as of those sources of contamination described when treating of *the prevention of* PESTILENCE. The measures recommended in that article are especially applicable to the prevention of, and protection from outbreaks of puerperal fevers in lying-in wards; and for the purification of these and other chambers, and of the bed-clothes and bedding on the occasions of these outbreaks. To that article I must, therefore, refer the reader, and more particularly to what I have stated at § 77., and when treating of the "*domestic sources of pestilence.*"

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PULSE. — *Pulsus.* — Σφυγμὸς. —*Pouls*, Fr.; — *Puls*, Germ.

CLASSIF. — GENERAL PATHOLOGY. — SEMEIOLOGY.

1. The *arterial pulse* is produced by the blood thrown into the aorta by each contraction of the left ventricle. There are *three elements* which contribute to the production of this phenomenon: — 1st. The arterial tubes or vessels which manifest it to the touch; — 2d. The blood, or contents of these tubes, which, upon receiving the impulse from the heart, affect the condition of the arteries; — and, 3d. The heart itself, which originates the impulse transmitted through the blood to the vessel, and by the vessel to the touch. According to the conditions of these three elements or constituents of the pulse—the arteries, the blood and the heart—and to the various combinations which they may severally produce, will the pulse vary in disease, and even in health, although within a much more confined range. These three constituents of the pulse require an individual and particular consideration, in estimating the states of the pulse, or rather as the causes of these states, and in connecting these states with functional and organic changes — with the manifestations of vital power and action.

2. I. HISTORICAL NOTICES AS TO THE PULSE.— Little mention is made of the pulse by HIPPOCRATES; and CELSUS notices it chiefly to record his opinion as to its fallacies. GALEN may be justly viewed as the first who attempted to investigate the pathological relations of the pulse, and he did this at great length. An abridgment of his treatises on this subject has been made and published by ANDRÆA LACUNA. As far back probably as the days of GALEN, if not even further, the Chinese had published treatises on the pulse; and by means of their acquaintance with it, and by it chiefly, they pretended to a knowledge of all diseases. The importance attached to the pulse by GALEN, and by all the writers on medicine, in eastern countries, in ancient times, appears to have been such as to have given rise to the greatest charlatanry and pretence in the practice of medicine. It was supposed in those times, and down to the present day in these countries, that the pulse furnished all the information which the physician required, both as to the seat and as to the nature of a disease; and it was not until past the middle of the seventeenth century that attempts were made by BELLINI to investigate the subject with some reference to scientific principles; the researches and discoveries of HARVEY having opened paths by which the ruins of ancient opinion might be removed, and laid foundations for permanent structures. The publication of Sir J. FLOYER's "pulse watch," in 1707, first imparted precision to our estimation of the pulse; and various conditions of it, possessing much importance in practice, especially as being sources of prognosis, were pointed out by SOLANO, in 1731, and more clearly illustrated by NIHELL, in 1745, in his "New and extraordinary Observations concerning the Prediction of Crisis by the Pulse." The subject was further pursued by FOUQUET and BORDEU about the middle of the last century in France; and towards the close of that century by HEBERDEN and FALCONER in this country; these latter divesting the subject of much of the inanities and puerilities which had become connected with it since the days of GALEN. Although these writers had thrown aside much of the incumbrances under which sound observation was more or less concealed, still correct views as to the states of the pulse were very far from being entertained. Nor could such views be exhibited, whilst the morbid conditions—functional and organic—of the heart itself, the prime factor of the pulse, remained hardly or very imperfectly known.

3. II. PHYSIOLOGICAL PATHOLOGY OF THE PULSE.— Before the various states of the pulse can be duly considered, some notice must be taken of the conditions of each of the *three constituents* of the arterial pulse—of the *arteries*, of the *blood*, and of the *heart*. — *A.* The ARTERIES, as I have shown in other places (see articles IRRITABILITY and SYMPATHY), are not inert tubes, but living vessels endowed with certain *vital* as well as *physical* properties. — *a.* Their *physical properties* are chiefly expansibility, extensibility, and elasticity — *expansibility* in the expansion of their diameters or enlargement of their calibres, *extensibility* in their elongation to a certain extent during muscular movements, and other causes, and *elasticity*, or the recovery of their natural states immediately upon the removal of the expanding and elongating causes. These properties are possessed by arteries in a very eminent degree, and in virtue of their conformation — of their fibrous coats, and of their serous and dense cellular and connecting tunics. They are evinced to a great extent after death; but they exist to a greater extent during life, vitality not only endowing these vessels with peculiar properties, but also increasing their physical qualities.

4. *b. The vital properties of arteries*, and which contribute very remarkably to form the character of the pulse, depend especially upon the organic or ganglial nerves, which not only accompany all the arterial trunks and ramifications, form reticula around them, and are lost in their fibrous and serous coats; the states of organic nervous energy affecting the vital conditions of these vessels. These conditions or properties are referable to different states of one vital endowment, viz. *tone* or *tonicity*. According to the state of vital tone will the arteries manifest a greater or less degree of *expansion* or of *constriction*, both when subjected to the sense of sight, and when examined by the sense of touch. The *expansion* and the *constriction*

are states of vital tone — or different states of vitality manifested by the arterial system, through the medium or influence of the organic or ganglial nervous system supplying it, and are easily made apparent by means of various agents; as by plunging the hand in warm water, a certain increase of the vital expansion of the arterial vessels will follow, and the vessel will become full and broad; and by plunging the hand in cold water, the artery will become small and more constricted. In an excellent lecture by Dr. C. J. B. Williams (*Lond. Med. Gazette*, vol. xxi. p. 594.), he observes, that he repeatedly observed the aorta of an ass recently killed, contract very remarkably when plunged in cold water; whilst the pulmonary artery did not contract so much. The vital conditions of the arterial system vary remarkably: — 1st. With the states of vital energy of the whole frame—with the states of constitutional power; — 2d. With the influence of agents acting externally or internally on the vessels, the operation of agents varying according as they are thus external or internal; —3d. With the conditions of the capillary and venous circulations, and with the freedom from obstacle to the onward transmission of blood circulating through the arteries.

5. (*a.*) When *constitutional or vital power is unimpaired*, the arterial pulse then presents a state of healthy or natural tone, modified somewhat with the peculiarity of constitution or the amount of vital energy. In these cases the pulse evinces neither broadness, nor expansion, nor softness, nor weakness, on the one hand, nor undue constriction, hardness, or smallness on the other. It is then possessed only of moderate firmness and fulness; its frequency or number in a given period depending upon the action of the heart. When vital power is *reduced*, and in proportion to the reduction, is the tone of the artery weaker and rendered soft, compressible, and otherwise changed according to the states of the blood and heart's action (see §§ 6, *et seq.*). When, on the other hand, the vital energy is *excited*, the state of the vessel is then firm, round, or hard, and otherwise altered with the action of the heart, and the quantity and quality of the blood. Marked modifications in the state of the arteries result from agents influencing the conditions of the organic nervous system; but these agents frequently also co-ordinately affect the heart — both the arteries and the heart; whether these agents affect this part of the nervous system *primarily* and *externally* to the arteries and heart, or *secondarily* and *internally* to the vascular system, by imbibition and absorption, or through the medium of the blood; the state of the arterial vessels being, in either case, thereby more or less changed, according to the nature of, and the influence exerted by, these agents. The natural conformation of the arterial system is sometimes different in different individuals, some persons possessing a more powerfully constituted state of this system than others, especially in respect of the fibrous coat, the vessels thereby acquiring increased tone, and often a greater degree of hardness or firmness, both in health and in states of excited action.

6. *B.* The Blood is another necessary constituent of the pulse; the uninterrupted column of blood, extending from the commencement of the aorta to the part of the artery to which the finger is applied, when feeling the pulse, being essential to the sensation communicated by the artery to the organ of touch. It is presumed, in our examinations of the pulse, that the states of this column of blood are the same throughout the arterial system, the difference being only as respects the diameter and length of the column, according to the artery which is felt. This, however, is not always the case, as slight modifications will occasionally follow from local determinations, influenced by the state of nervous power, and from local impediments or obstructions to the venous or capillary circulation of a part. But without reference to these modifications, we shall find sufficient sources of alterations of the pulse in the *conditions of the blood* circulating through the arterial system. The conditions of the blood which affect the pulse are, — 1st. *Quantity*, —2d. *Quality*, or alterations in its physical and *sensible conditions*, and probably also in its *vital states*.

7. *a.* Adverting first to *quantity*, it is obvious that any deviation from that quantity which is adapted to the capacity of the vascular system generally will affect, in a very sensible manner, the arterial pulse, as respects both the states of the arteries, and the contractions of the heart. When there is a *due correspondence* between the capacity of the vascular system and the quantity of blood circulating in this system, the coats of the arteries will be kept in that state of healthy tension, or tone, favourable to a regular, firm, free, natural, or healthy pulse, varying chiefly in frequency with the state of the heart's action, which will depend upon either exciting or depressing causes. — (*a.*) When the quantity of blood in the system is *excessive*, more or less of oppression may be evinced in the state of the artery, as well as either of increased or of diminished frequency, much of these changes arising from existing states of vital excitement or depression. Excessive fulness of blood however may exist, and, being attended by congestion of one of the minor circulations, —of the lungs, of the liver, or of the sinuses of the cerebro-spinal axis, — may not materially affect the pulse. But as this state will not long continue without evincing its connection with either depression or reaction of vital power, so will the pulse, through the medium of the heart's action, be slow or frequent, as well as oppressed; the degree of frequency depending on the heart's contractions, and these contractions depending upon the state of the organic nervous or vital influence, and other causes, to be noticed hereafter. The sensation produced by an artery in cases of excessive vascular fulness I have designated that of oppression, the vessel feeling as if it were kept in a state of tension, or of distension, in the intervals between the beats; and, if the pulse be at the same time much accelerated, an idea suggests itself that the heart is excited by the load, and, by its more frequent contractions, is endeavouring to disembarrass itself, and the vascular system generally; whilst if, with this state of the artery, the pulse is slow, the notion presents itself that the organic nervous energy actuating the heart is insufficient for the amount of blood circulating through the frame. Under these circumstances, it is found that the abstraction of blood renders the pulse more free, less tense or oppressed, and more natural, whilst it diminishes the acceleration in the former circumstances, and increases it in the latter.

8. (*b.*) *Deficiency of blood* is attended by a very different state of the arterial pulse; the frequency of it depending, as in all other cases, upon the cardiac action, and the tone of the vessel very much upon the state of vital power. When the blood is very deficient in quantity, the state of the pulse will depend much upon the power of the vessel, and of the vascular system generally, to accommodate themselves to that deficiency. If the vital or the organic nervous power is not depressed to a very low state, the vessels will evince merely less fulness, or become more constricted, or smaller, yet, at the same time, soft or compressible. If vital power is excited or irritated, notwithstanding the loss of blood, the vessel imparts, with great frequency, much quickness, or suddenness of impulse against the finger, and greater constriction. If it be extremely depressed, the pulse may be either rapid or slow, according to the irritability of the heart, but the vessel feels very soft or compressible, the slightest pressure obstructing its canal, whilst the impulse communicated to the column of blood in the artery is quick or rapid, when the heart's action is excited, the vessel feeling as if it were nearly empty between each impulse, and is slow, undulating, and weak when the contractions of the left ventricle are much weakened, and irritability exhausted. Much, however, of the changes in the states of the pulse, with alterations in the *quantity* of blood in the body, is owing not only to the associated state of cardiac action, but also to the *quality*—to the constitution and states of the blood, physically, sensibly, and vitally.

9. *b.* The *quality of the blood*, as well as the quantity, has been shown in various parts of this work (*see art.* Blood, Disease, Fever, Pestilence, &c.) to be remarkably changed in its sensible appearances, and in its vital states. I have, in several places, attempted to show that the blood, in addition either to excess or deficiency in its quantity, may have either an excess or deficiency of its red globules, or of its fibrin, or of any other of its constituents; and that it may, moreover, abound in morbid or in foreign matters, owing either to imbibition and absorption, or to imperfect depuration and excretion. Still there are manifestly additional morbid states of this fluid, which also affect the pulse, although these cannot be accurately estimated in grade or kind: these are the vital conditions of the blood, derived from the vessels and body generally, through which this fluid circulates. That there is a very intimate relation, and even connection, between the vital conditions of the vascular system and the constitution of the blood, especially of its globules and liquor sanguinis, cannot be doubted; and, although the vital states of the blood are derived from, or dependent upon, those of the vascular system, still they react upon this system, especially if they continue for any time, or are not removed by the efforts of the constitution, or by the aids of medicine.

10. During the progress or continuance of changes in the sensible qualities and vital states of the blood, especially as evinced in the course of rheumatic, inflammatory, or of adynamic, malignant, and pestilential maladies, the pulse can only imperfectly manifest such changes, which usually commence in the nervous and vascular systems, although most apparent in the blood. In cases of *vascular excitement*—in inflammations, in acute rheumatism, &c. the fibrin of the blood is abundant, and the vital crasis of the coagulum is firm or even increased, and these states may continue after repeated blood-lettings, showing that these changes of the blood proceed from vascular excitement or reaction, rather than that the changes in the blood cause the vascular reaction; the condition of the blood being the effect, not the cause of the state of the pulse, which is always more or less quick, sharp and rapid, owing to the increased irritability and irritation of the heart. When, with this state of vascular excitement, there is also vascular fulness, then the pulse will feel full and hard, as well as sharp, quick, or rapid; but, if the vascular excitement continues, or is fed by irritation or pain, or by the state of organic nervous sensibility and energy, after the vascular system is depleted, or after large losses of blood, then the pulse will become sharp, constricted, rapid, and of various grades of tone or strength, according to the nature and seat of the disease, as observed in acute rheumatism, &c.

11. In cases of *depressed vital power*, or when the organic nervous energy and vascular action are more or less weakened, as well as otherwise altered, as in the course of malignant, pestilential, or specific maladies, the fibrin of the blood is diminished, the constitution of the hæmato-globuline is altered, and the crasis of the blood remarkably impaired. In these circumstances, the pulse is affected, and the experienced and close observer may even predicate from the state of the pulse the character of the changes proceeding in the blood, although he may not infer their exact amount; but, according to their nature and extent—in proportion to the loss of vital power and of the crasis of the blood, will the pulse become open, broad, soft, weak, and compressible, the artery suggesting to the mind of the examiner ideas of defective or lost tone, of impaired elasticity, and of relaxation. But, with these changes in the vessel, others are associated depending upon the amount of blood, and the state of the heart's action. If the blood be abundant in quantity, and in proportion to that abundance, will the pulse be full as well as broad and soft. The artery will furnish a sensation of largeness, and feel full and broad, but still soft between each impulse communicated by the contraction of the ventricle, the parietes of the vessel feeling as if they yielded to the impulse, especially if the heart's action be excited. If on the other hand the amount of blood be deficient, the pulse is not only soft, weak, relaxed or open, and very compressible, but the vessel feels to the examiner as if it were nearly empty between each wave of fluid undulating through it, the impulse of each wave being quick or sudden, whilst the heart's action continues excited; but weak, or languid, or slow, as the irritability of the heart becomes exhausted. The action of the heart will be noticed hereafter, but it may be now stated, that, in these as well as in many other circumstances, to it belong those changes in the number of the pulse in a given time, with the qualities of quickness, sharpness, or suddenness of the impulse of the column of blood against the parietes of the vessel where it is pressed upon by the finger, or with the opposite qualities of languor, weakness, smallness, &c., ac-

are states of vital tone — or different states of vitality manifested by the arterial system, through the medium or influence of the organic or ganglial nervous system supplying it, and are easily made apparent by means of various agents; as by plunging the hand in warm water, a certain increase of the vital expansion of the arterial vessels will follow, and the vessel will become full and broad; and by plunging the hand in cold water, the artery will become small and more constricted. In an excellent lecture by Dr. C. J. B. WILLIAMS (*Lond. Med. Gazette*, vol. xxi. p. 594.), he observes, that he repeatedly observed the aorta of an ass recently killed, contract very remarkably when plunged in cold water; whilst the pulmonary artery did not contract so much. The vital conditions of the arterial system vary remarkably: — 1st. With the states of vital energy of the whole frame—with the states of constitutional power; — 2d. With the influence of agents acting externally or internally on the vessels, the operation of agents varying according as they are thus external or internal; —3d. With the conditions of the capillary and venous circulations, and with the freedom from obstacle to the onward transmission of blood circulating through the arteries.

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6. *B.* The BLOOD is another necessary constituent of the pulse; the uninterrupted column of blood, extending from the commencement of the aorta to the part of the artery to which the finger is applied, when feeling the pulse, being essential to the sensation communicated by the artery to the organ of touch. It is presumed, in our examinations of the pulse, that the states of this column of blood are the same throughout the arterial system, the difference being only as respects the diameter and length of the column, according to the artery which is felt. This, however, is not always the case, as slight modifications will occasionally follow from local determinations, influenced by the state of nervous power, and from local impediments or obstructions to the venous or capillary circulation of a part. But without reference to these modifications, we shall find sufficient sources of alterations of the pulse in the *conditions of the blood* circulating through the arterial system. The conditions of the blood which affect the pulse are, — 1st. *Quantity*, — 2d. *Quality*, or alterations in its physical and *sensible conditions*, and probably also in its *vital states*.

7. *a.* Adverting first to *quantity*, it is obvious that any deviation from that quantity which is adapted to the capacity of the vascular system generally will affect, in a very sensible manner, the arterial pulse, as respects both the states of the arteries, and the contractions of the heart. When there is a *due correspondence* between the capacity of the vascular system and the quantity of blood circulating in this system, the coats of the arteries will be kept in that state of healthy tension, or tone, favourable to a regular, firm, free, natural, or healthy pulse, varying chiefly in frequency with the state of the heart's action, which will depend upon either exciting or depressing causes. — (*a.*) When the quantity of blood in the system is *excessive*, more or less of oppression may be evinced in the state of the artery, as well as either of increased or of diminished frequency, much of these changes arising from existing states of vital excitement or depression. Excessive fulness of blood however may exist, and, being attended by congestion of one of the minor circulations, — of the lungs, of the liver, or of the sinuses of the cerebro-spinal axis, — may not materially affect the pulse. But as this state will not long continue without evincing its connection with either depression or reaction of vital power, so will the pulse, through the medium of the heart's action, be slow or frequent, as well as oppressed; the degree of frequency depending on the heart's contractions, and these contractions depending upon the state of the organic nervous or vital influence, and other causes, to be noticed hereafter. The sensation produced by an artery in cases of excessive vascular fulness I have designated that of oppression, the vessel feeling as if it were kept in a state of tension, or of distension, in the intervals between the beats; and, if the pulse be at the same time much accelerated, an idea suggests itself that the heart is excited by the load, and, by its more frequent contractions, is endeavouring to disembarrass itself, and the vascular system generally; whilst if, with this state of the artery, the pulse is slow, the notion presents itself that the organic nervous energy actuating the heart is insufficient for the amount of blood circulating through the frame. Under these circumstances, it is found that the abstraction of blood renders the pulse more free, less tense or oppressed, and more natural, whilst it diminishes the acceleration in the former circumstances, and increases it in the latter.

8. (*b.*) *Deficiency of blood* is attended by a very different state of the arterial pulse; the frequency of it depending, as in all other cases, upon the cardiac action, and the tone of the vessel very much upon the state of vital power. When the blood is very deficient in quantity, the state of the pulse will depend much upon the power of the vessel, and of the vascular system generally, to accommodate themselves to that deficiency. If the vital or the organic nervous power is not depressed to a very low state, the vessels will evince merely less fulness, or become more constricted, or smaller, yet, at the same time, soft or compressible. If vital power is excited or irritated, notwithstanding the loss of blood, the vessel imparts, with great frequency, much quickness, or suddenness of impulse against the finger, and greater constriction. If it be extremely depressed, the pulse may be either rapid or slow, according to the irritability of the heart, but the vessel feels very soft or compressible, the slightest pressure obstructing its canal, whilst the impulse communicated to the column of blood in the artery is quick or rapid, when the heart's action is excited, the vessel feeling as if it were nearly empty between each impulse, and is slow, undulating, and weak when the contractions of the left ventricle are much weakened, and irritability exhausted. Much, however, of the changes in the states of the pulse, with alterations in the *quantity* of blood in the body, is owing not only to the associated state of cardiac action, but also to the *quality*—to the constitution and states of the blood, physically, sensibly, and vitally.

9. *b.* The *quality of the blood*, as well as the quantity, has been shown in various parts of this work (see *art.* BLOOD, DISEASE, FEVER, PESTILENCE, &c.) to be remarkably changed in its sensible appearances, and in its vital states. I have, in several places, attempted to show that the blood, in addition either to excess or deficiency in its quantity, may have either an excess or deficiency of its red globules, or of its fibrin, or of any other of its constituents; and that it may, moreover, abound in morbid or in foreign matters, owing either to imbibition and absorption, or to imperfect depuration and excretion. Still there are manifestly additional morbid states of this fluid, which also affect the pulse, although these cannot be accurately estimated in grade or kind: these are the vital conditions of the blood, derived from the vessels and body generally, through which this fluid circulates. That there is a very intimate relation, and even connection, between the vital conditions of the vascular system and the constitution of the blood, especially of its globules and liquor sanguinis, cannot be doubted; and, although the vital states of the blood are derived from, or dependent upon, those of the vascular system, still they react upon this system, especially if they continue for any time, or are not removed by the efforts of the constitution, or by the aids of medicine.

10. During the progress or continuance of changes in the sensible qualities and vital states of the blood, especially as evinced in the course of rheumatic, inflammatory, or of adynamic, malignant, and pestilential maladies, the pulse can only imperfectly manifest such changes, which usually commence in the nervous and vascular systems, although most apparent in the blood. In cases of *vascular excitement*—in inflammations, in acute rheumatism, &c. the fibrin of the blood is abundant, and the vital crasis of the coagulum is firm or even increased, and these states may continue after repeated blood-lettings, showing that these changes of the blood proceed from vascular excitement or reaction, rather than that the changes in the blood cause the vascular reaction; the condition of the blood being the effect, not the cause of the state of the pulse, which is always more or less quick, sharp and rapid, owing to the increased irritability and irritation of the heart. When, with this state of vascular excitement, there is also vascular fulness, then the pulse will feel full and hard, as well as sharp, quick, or rapid; but, if the vascular excitement continues, or is fed by irritation or pain, or by the state of organic nervous sensibility and energy, after the vascular system is depleted, or after large losses of blood, then the pulse will become sharp, constricted, rapid, and of various grades of tone or strength, according to the nature and seat of the disease, as observed in acute rheumatism, &c.

11. In cases of *depressed vital power*, or when the organic nervous energy and vascular action are more or less weakened, as well as otherwise altered, as in the course of malignant, pestilential, or specific maladies, the fibrin of the blood is diminished, the constitution of the hæmato-globuline is altered, and the crasis of the blood remarkably impaired. In these circumstances, the pulse is affected, and the experienced and close observer may even predicate from the state of the pulse the character of the changes proceeding in the blood, although he may not infer their exact amount; but, according to their nature and extent—in proportion to the loss of vital power and of the crasis of the blood, will the pulse become open, broad, soft, weak, and compressible, the artery suggesting to the mind of the examiner ideas of defective or lost tone, of impaired elasticity, and of relaxation. But, with these changes in the vessel, others are associated depending upon the amount of blood, and the state of the heart's action. If the blood be abundant in quantity, and in proportion to that abundance, will the pulse be full as well as broad and soft. The artery will furnish a sensation of largeness, and feel full and broad, but still soft between each impulse communicated by the contraction of the ventricle, the parietes of the vessel feeling as if they yielded to the impulse, especially if the heart's action be excited. If on the other hand the amount of blood be deficient, the pulse is not only soft, weak, relaxed or open, and very compressible, but the vessel feels to the examiner as if it were nearly empty between each wave of fluid undulating through it, the impulse of each wave being quick or sudden, whilst the heart's action continues excited; but weak, or languid, or slow, as the irritability of the heart becomes exhausted. The action of the heart will be noticed hereafter, but it may be now stated, that, in these as well as in many other circumstances, to it belong those changes in the number of the pulse in a given time, with the qualities of quickness, sharpness, or suddenness of the impulse of the column of blood against the parietes of the vessel where it is pressed upon by the finger, or with the opposite qualities of languor, weakness, smallness, &c., ac-

cording to the excited or weakened, or nearly exhausted irritability of this organ.

12. C. The HEART furnishes, besides *frequency*, several other qualities, as already noticed, to the pulse. The influence of the heart on the pulse is — 1st. *Functional*, or dependent upon the strength or weakness of the contractions of the organ, and upon the grades of irritability possessed by it; — and, 2d. *Structural*, or owing to lesions in the parietes of the cavities, or in the valves or orifices of the heart. — *a.* The *functional influence* of the heart on the pulse varies with different diseases, as these diseases are characterised by excited or increased organic nervous energy and vital power, and increased irritability of muscular and contractile parts on the one hand, or by impaired or exhausted power and irritability on the other. The heart being, by nervous supply from the ganglial and cerebro-spinal nervous systems, and by muscular structure and vascular connections, intimately associated with all the vital functions, is not only influenced by these functions, but also influences them. But whatever may be the state of the heart's action, thus influenced and influencing, the *frequency* and the character of the *impulse* communicated to the column of blood in the artery is produced by the contractions of the left ventricle. When the actions of the heart are unimpaired in tone or in strength, if the irritability of its structure is unexhausted, the frequency of the pulse is seldom very great, although the excitement may be very considerable. In strongly constituted persons, the pulse seldom rises above 100 in a minute, even during inflammations; and it is only as the excitement or irritation becomes associated with diminution of vital power, this latter always gradually supervening upon, and increasing with the continuance of, excitement or irritation, that the pulse becomes very frequent, or much above 100. In delicate, susceptible, or nervous females especially, the pulse is often very rapid during nervous excitement; or in various febrile or inflammatory diseases, or in states of irritation; but in them power is deficient, and although the irritability of the heart is readily excited, it is the more rapidly exhausted.

13. But frequency of pulse may be occasioned not only by nervous excitement, by increased irritability, or by febrile or inflammatory action, but also by losses of blood, and by the want of due correspondence between the quantity of blood and the capacity of the vascular system in general. It is difficult, however, to determine whether or not the increased frequency be caused by this want of correspondence, and the efforts made to compensate for deficient quantity by accelerated motion, or by augmented excitability consequent upon the loss of blood. Most probably, this latter effect is that which is immediately caused by this loss; the former effect, or the compensating influence of accelerated motion, being the result of exalted excitability. But the acceleration of the heart's contractions caused by losses of blood has always a more or less obvious relation to the amount of such loss, and to the conditions of the blood which remains. If the quantity lost be very great, the irritability of the heart soon becomes exhausted, even although the morbid state of the remaining blood, or other sources of irritation, may tend to excite and to prolong the irritability of this organ. This is evinced by various diseases for which large vascular depletions are ordered, and by acute or active hæmorrhages, &c. At the commencement of the former of these, whilst the vascular system is full, vital energy excited, and the blood uncontaminated, or at least not very materially altered, the pulse is full, firm, or strong, and not remarkably frequent, the contractions of the heart being energetic, without abruptness or quickness. After a considerable loss of blood, the pulse becomes soft, the impulse of the column of blood against the wall of the artery pressed on by the finger much more frequent and more abrupt, and the vessel is felt more empty in the interval between each impulse. The contractions of the ventricles are more frequent and sudden, because the excitability of the organ is at first increased, probably not only in consequence of the loss of power, but also owing to the state of the blood supplied to the structure of the heart itself. If still more blood be lost, the constitution of the remaining blood is more or less altered, the pulse becomes more accelerated, more abrupt and quick, softer, smaller, or more compressible; the contractions of the heart more numerous and abrupt, but much less energetic; and, if the patient be not aided, or if still more blood is abstracted, the action of the heart becomes weaker and weaker; in some cases so frequent as not to be counted; in others as remarkably slow, according to the states of the remaining blood, and of the organic and cerebro-spinal systems, by which the vital properties of muscular structures, irritability and excitability, are developed and influenced.

14. A somewhat similar procession of changes in the pulse follows acute hæmorrhages. During the vascular excitement often preceding the loss of blood, the pulse is very full, more or less frequent, and often bounding, the impulse of the column of blood against the walls of the vessel apparently exciting a reaction, or developing the elastic property of the artery. In this case the contraction of the ventricle, and the consequent momentum transmitted to the column of blood is so great or energetic as partially to overcome the vital tonicity of the artery, and to manifest the resiliency of its walls — hence the bounding or hæmorrhagic pulse. But as soon as blood is lost, particularly if the quantity be large, the pulse becomes still more frequent, quicker, or more abrupt, much softer and opener, the vessel feeling more empty, or at least much more compressible, in the intervals between the abrupt or sudden pulsation. If the hæmorrhage be still progressive, and excessive or fatal, the pulse will present changes similar to those just mentioned, modified, however, by constitution, by the seat of hæmorrhage, and by the diversified circumstances affecting the patient externally and internally. In many cases, however, commencing in the acute manner described, a moderate loss of blood, by relieving the vascular system of a load too great for the tonicity of the vessels, and by lowering the increased action of the heart, restores this system and the pulse to their natural states, and, with such restoration, a cessation of the hæmorrhage results.

15. *b.* The influence of *lesions of the heart* upon the pulse is necessarily remarkable. But the changes in the pulse which these produce be-

long to the diseases of the membranes, the valves, the orifices, and the structure of this organ. (See *art.* HEART.) These changes consist of intermissions, irregularities, smallness, weakness, remarkable slowness, and numerous other states of the pulse, which, however, can never be duly estimated without a close examination of the sounds and impulses of the heart simultaneously with a similar examination of the pulse, and a comparison of the phenomena furnished both by the heart and by the artery. Many of the states of the pulse caused by structural lesions of the heart may also proceed from nervous and functional disorder; impaired nervous power of the organ, with or without other functional changes affecting the state of the heart or large vessels, so disordering the actions of the ventricles, as to produce intermissions, irregularity, inequality, remarkable frequency or slowness, or smallness, &c., which soon disappear as nervous power is restored, or the functional disorder is removed. A pulse may present intermissions, although the heart contracts during the intermission, the contraction being only too weak to communicate a momentum to the column of blood, sufficient to be felt by the examiner, or the quantity of blood thrown out by the ventricle being two small to produce any manifest change in the column of blood in the artery.

16. III. SEMEIOLOGICAL NOTICES OF THE PULSE. — Having considered the *principles* on which our knowledge of the pulse is based, and with due reference to the principal conditions of the three *constituents*, or elements of the pulse, it may be useful to take a brief view of those states of the pulse which attend, and hence indicate certain morbid actions, and their several seats. In the view which has just been taken of the elementary principles of the pulse, it has been shown, that changes in the vital manifestations of the frame — in the organic nervous energy, in the irritability or excitability of living fibres, and in the quantity and quality of the blood, remarkably and co-ordinately affect the tone of the vessels, and the contractions of the ventricle; and that, whilst an alteration may originate in any one of the three constituents of the pulse, and affect it, chiefly, for a time, it will not long exist thus limited, but will implicate, more or less, the others. Changes commencing in the blood, will affect both the tonicity of the vessels and the actions of the heart, and generally, co-ordinately, in grade and in kind. Changes, moreover, originating in the organic nervous system will necessarily extend themselves, not only to the heart, but also to the arteries, as it is this system which supplies and actuates both heart and arteries, and ultimately to the blood and structures generally; and the alterations thus superinduced in the blood will react upon both the heart and arteries. Hence in the course of disease, the pulse becomes a more or less accurate index of the vital conditions of the heart, of the vascular system, generally, and even of the blood; the indications furnished by it being accurate, according to the powers of the physician to interpret them correctly, the want of accuracy depending more upon the observer than the object of observation. — The pulse varies in *diseases*, and even slightly in *health*, as to its *development* and *rhythm*.

17. i. The DEVELOPMENT of the pulse differs in different cases, and in different stages of the same case, in *force*, *consistence* or *tone*, and in *volume*; and, according to these differences, and to the various combinations of these, the following states of the pulse occur, without reference to frequency or rhythm: — 1st. Hard, resistant, tense, firm, or sthenic; — 2d. Contracted, constricted, or concentrated, and small; — 3d. Full, large, broad, ample, or open, and bounding, rebounding, &c.; — 4th. Soft, compressible, empty, weak, feeble, unequal, small, &c.; — 5th. Precipitate, quick, rapid, sudden, vibratory, &c.; — 6th. Languid, undulatory, &c. Several of these terms are, however, nearly synonymous, and convey the same, or very nearly the same, idea. — ii. The RHYTHM of the pulse, in its various grades, is *superadded* to any of the above, and differs remarkably in frequency, regularity and inequality, or intermittence.

18. *A.* A *hard*, *resistent*, *tense*, *firm*, or *sthenic pulse* are terms applied by writers to convey nearly the same notion, and are met with, attended by more or less *acceleration* of the pulse, in young, robust persons of the sthenic diathesis and muscular habit, and irritable temperament, during the early stage of reaction in inflammatory fevers, in inflammations of serous membranes, in acute rheumatism, in inflammations of the membranes of the brain, in the hot stage of intermittents, and in excentric hypertrophy of the heart, and when the arterial system is strongly developed. They always indicate the sthenic diathesis, and excited power and action, and admit of large vascular depletions.

19. *B.* A *contracted*, *constricted*, *concentrated*, and *small* and *hard pulse* are various terms applied to the same state, and are intended to convey an idea of that pulse, which is met with, in some cases of the diseases just mentioned, especially when there is less fulness of blood, and which is usually attended with greater acceleration of the heart's contractions, and indicates a more violent and less favourable disease. This state of the pulse as well as the foregoing seldom continues long without passing into some one of those about to be noticed; and it more especially indicates the supervention of structural lesion, and a dangerous issue if not promptly or actively treated, especially by moderate and early depletion, diaphoretics, relaxants, and derivatives.

20. *C.* A *full*, *large*, *ample*, *broad*, *open*, *bounding or rebounding pulse* are states not altogether identical, but very nearly approaching each other. They are met with in various diseases. — *a.* In inflammatory fevers, especially at an advancing stage or after a moderate depletion. — *b.* During inflammations of mucous, cellular, and parenchymatous structures. — *c.* In inflammations of serous membranes after the preceding states of the pulse have been removed by large blood-lettings. — *d.* Preceding and accompanying hæmorrhages, the pulse being also much accelerated when the hæmorrhage is abundant, and when inflammations have been treated by copious blood-lettings. The pulse is frequently then open and compressible, rather than full, and often passes into the two next states to be noticed. A full, large, or broad pulse is often observed in inflammations of the structure of the lungs, and of the substance of the liver, with various grades of acceleration. It is generally met with in young, plethoric persons, and in the sanguine temperament, also in the scrofu-

pulse during acute diseases, more especially when these diseases occur during the puerperal state. A pulse ranging above 110, in a person older than twenty-five years, of the male sex, and not of the nervous or irritable temperament, is not without risk, the amount of which will depend on concomitant circumstances. If it rise to 120, or above this, the danger is great, unless in nervous and susceptible temperaments, and in females. In this sex, especially the nervous, the hysterical, irritable, or delicate, the pulse may range as high as 130 without any risk; but this will depend much upon the nature of the disorder, upon its seat, and upon other circumstances.

32. The frequency of the pulse is seldom very great in the early stage of acute diseases, whilst vital power is unimpaired, as of inflammations, fevers, &c., unless in the class of patients just mentioned. It is chiefly when these diseases have gone on to the exhaustion of vital power, or to the contamination of the blood, and in this class of females, and in the puerperal state, that the pulse rises above 120; and at that amount or frequency, and more especially if the number is increased, it behoves the physician to be cautious as to his prognosis, and as to the treatment he may adopt; for, unless the pulse be also firm, or full, or hard, or at least not deficient in tone, venæsection, particularly if it be large, may aggravate the disease, remarkably increase the frequency of the pulse, and even endanger the patient. Great acceleration of the pulse, as above 110, should be viewed as militating against, rather than in favour of, vascular depletions, unless in small quantity, or locally. If, however, this frequency be attended by fulness, hardness, or firmness, vascular depletions, to an amount which concomitant states and symptoms will regulate, may be prescribed, especially when serous surfaces are affected. When the acceleration amounts to 110 or 120 and upwards, and when it is attended by a very soft or compressible, precipitate, small, feeble, or languid state of the pulse (see §§ 8, *et seq.*), then restorative measures, rather than depletory or depressant, are required, — and required with an urgency proportionate to the greatness of the acceleration and the want of power or of tone in the vessel, and other concomitant symptoms.

33. *c. Inequality* or *irregularity* of frequency of pulse, as well as of fulness and power, is often observed, especially in persons far advanced in life. It is sometimes met with in *children* when asleep, even when in health. It occurs in diseases of the heart, in affections of the liver, in those of the brain, and not infrequently in the maladies of the puerperal state. When, with this inequality, the pulse is small, weak, or precipitate also, or when the inequality is very great, then a serious or even dangerous state may be inferred. LENOY says (*Du Prognostic dans les Maladies Aiguës*, § I. ch. i.), that when this state of the pulse is accompanied with hæmorrhage, or with bilious vomiting or purging, a favourable crisis may take place.

34. *Irregularity*, or marked inequality, of the pulse is not infrequent in the puerperal states, especially at the accession and in the advanced progress of puerperal fevers, and should be viewed as indicative of great danger, especially if the pulse is at the same time very rapid, broad, precipitate, or undulating. In these cases, as well as in the advanced stage of malignant fevers, this state of the pulse is generally connected with failure of vital power and an altered condition of the blood.

35. The pulse is necessarily always of the same frequency in different parts of the body; but it varies often in strength, fulness, and tone, in opposite or remote parts. In hemiplegia, the pulse is often weaker, smaller, and softer in the paralysed side, and, in paraplegia, in the lower extremities. In cases of local determinations of blood, and in susceptible and nervous persons, the pulse varies in fulness, volume, and strength, in different parts, according as the local irritation and vital power may determine an increased flow of blood, and thereby disturb the natural equability of the circulation and distribution of the blood.

36. *d.* An *intermitting pulse* is not uncommon in every period of life, and in different diseases. It is rarely observed in children, unless when they are the subjects of rheumatic endocarditis or pericarditis, or of the more dangerous states of disease of the brain. It is in rare instances also observed in children when they are asleep, but not so often as inequality and slowness of pulse. An intermittent pulse is much more common in aged persons, and common in proportion to advanced age. At this period of life it is often caused by organic change; but it is sometimes, although not so frequently, the result of impaired organic nervous energy, and is connected with dyspepsia, or with flatulence or torpor of the liver. In these latter circumstances, however, the intermissions are not so frequent, nor so complete, as in cases of organic lesion; and the pulsations between the intermissions are more equal. At all periods of life, functional intermissions of the pulse may occur, although most frequently in advanced age, in the dyspeptic, the flatulent and the sedentary; and in these it is generally irregular, or after various numbers of regular pulsations, and is caused by impaired organic nervous power, and by flatulence either pressing on the diaphragm, or rising in the œsophagus, and embarrassing the dilatations of the auricles and ventricles. In many instances, however, of these intermissions, the ventricle does not altogether fail to contract; it only contracts too weakly, or throws out an insufficient quantity of blood to occasion the usual impulse of the column of blood in the vessel on the finger (§§ 8, *et seq.*). In these cases, therefore, the heart should always be examined by percussion, and by the ear, in order to ascertain the state of contraction of the left ventricle, and to ascertain the cause of the intermission, and its dependence upon functional disorder, or upon organic lesion; as well as the nature of that lesion as far as this may be inferred. When the intermission is complete, is frequent, and depends upon organic lesions, the danger is greater and more imminent than when the intermission is merely incomplete, and caused by impaired vital power, unless indeed at a far advanced stage of low or malignant fevers, or in acute diseases attended with effusion into shut cavities. Our opinions, however, as to the indications furnished by intermissions of the pulse, should depend much upon the nature and history of the diseases in which they are observed, and upon the character of the pulse and of the sounds of the heart's contractions between the intermissions. An intermittent pulse, in connection with

great frequency or even with remarkable slowness, with a small, weak, languid, or undulating state of the vessel, occurring in hæmorrhagic diseases, or at an advanced period of fevers, especially when they are attended by hæmorrhages, is generally a fatal indication.

37. It is unnecessary in this place to consider at greater length the several irregularities of the pulse, as they are noticed, more appropriately when treating of these diseases, in which they are most apt to occur. Nor will my limits admit of any notice of the influence of diverse stimuli, or of various depressants, on the pulse. I may, however, simply mention, that the remarkable influence of the exciting emotions of the mind on the one hand, and of the depressing emotions on the other, upon the frequency and character or development of the pulse should never be overlooked; that the nature of the usual food and beverages of the patient is also important, especially when either has been partaken of shortly, or even for some time, before the pulse is examined; and that great frequency of pulse, especially when caused by exhaustion and vital depression, will often be reduced most remarkably by suitable stimuli and restoratives, even although the skin may be hot, if other symptoms do not decidedly contra-indicate them. The effects of various energetic agents on the pulse will be seen by referring to the symptoms produced by poisons. (See *art.* POISONS.)

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PURPURA. — SYNON. — Πορφύρα, Galen.; — *Purpura*, Riverius; — *Petechiæ sine febre*, Auct. Var.; — *Scorbutus*. — *Hæmorrhœa petechialis*, Adair; — *Phænigmus petechialis*, Sauvages; — *Porphyra*, Good; — *Morbus maculosus hæmorrhagicus*; *Morbus maculosus Werlhoffii*, *Purpura hæmorrhagica*; — *Purpura sine febre*; — *Miliaria rubra*, Auct.; — *Pourpre*, Fr.; — *der Purpur*; *das Purpur friessel*, Germ.; — *The Purples*.

CLASSIF. — 3d *Class*, Sanguineous diseases. — 4th *Order*, Cachexies (Good.); — 3d *Order*, 5 *Genus* (*Bateman*). CLASS IV. ORDER IV. (*Author*).

1. DEFINIT. — i. NOSOLOG. — *The occurrence of small, distinct, purple specks or patches in the cutaneous surface, attended by languor, general debility, sometimes by pains in the limbs, and always by evidence of disorder of the digestive, the assimilating, and excreting functions.*

2. ii. PATHOLOG. — *Depressed organic nervous energy giving rise to impaired tone of the capillaries, especially of the mucous and cutaneous surfaces, and to diminished crasis of the blood, thereby permitting the passive exudation of this fluid.*

3. This disease is intimately related to the *hæmorrhages* on the one hand, and to *scurvy* on the other; being intermediate between them, or forming the link which connects them; certain cases hardly admitting of any distinction between them and hæmorrhage from mucous surfaces, and others being almost identical with scurvy. *Purpura* usually appears independently of fever, with a number of reddish, purplish, or livid spots, of various sizes, on the cutaneous surface, these spots being usually termed *petechiæ*, *vibices*, and *ecchymoses*, according to their sizes; and, in the severer cases, it is attended by hæmorrhage from one or more surfaces, but chiefly from the mucous surfaces. The spots or patches are rarely elevated above the surrounding level of the skin, are not attended by any uneasy sensation, and, when examined closely, they are found to consist of exudations of blood between the layers of the dermis, or in the subjacent cellular tissue, or rather of serum coloured by the red globules variously altered. They cannot be viewed as an eruption, or rash, but are strictly a passive hæmorrhage of the vascular tissue of the skin.

4. Several acute diseases present, in their advanced stages, when organic nervous or vital power is exhausted, and the crasis of the blood diminished, or its constitution contaminated, or otherwise changed, this state of cutaneous hæmorrhagic exudation, in the form of petechiæ, vibices, ecchymoses, &c. and they have hence been denominated petechial fevers, or febris petechialis, or febris

purpurata; and, in these fevers, hæmorrhages from some mucous surface is very apt to supervene. These changes of the capillary vessels and blood, manifesting themselves more especially and visibly on the cutaneous and mucous surfaces, are not infrequent in low and asthenic fevers, both simply continued and exanthematic, and were more common formerly when a heating regimen, insufficient purging, and ventilation were generally employed. But, in these fevers, the petechiæ and purple spots are merely *symptomatic* — are consequent upon a series of changes produced by the fever, whilst they constitute one of the chief phenomena of the disease under consideration, although attended by others, and often followed by several of most serious import — the former being a continued or exanthematic fever *with petechiæ or purpura*, the latter, a *purpura sine febre*, or *purpura nonfebrilis*.

5. Riverius first distinguished purpura from the petechiæ sometimes symptomatic of the typhoid, adynamic, or malignant states of fever; and Werlhoff long afterwards briefly described it. Strack next noticed it, and was followed by Behrens and Graff; and almost contemporaneously with these last, by Duncan, sen., Adair, and Ferris. Soon afterwards Tattersall, Walker, Willan, Bateman, Berenger, Acrel, Pierquin, Brachet, and others referred to in the Bibliography, treated of purpura as an idiopathic malady. Willan considered the disease as nearly identical with scurvy; but this opinion was shown to be untenable by Parry and Harty, although an intimate connection cannot be disputed; and the alliance is certainly closer than these last writers have endeavoured to show.

6. Writers have generally divided the disease into certain varieties, respecting which they have not been quite agreed. Willan and Bateman have designated the *Purpura simplex*, *P. hæmorrhagica*, *P. urticans*, *P. senilis*, and *P. contagiosa*. Rayer has recognised the *simplex*, the *hæmorrhagica*, and the *senilis*, to which he has added the *febrilis*. Biett considers that the first and second of these varieties only deserve notice, and that the others are rare occurrences, or are symptoms belonging to other maladies. Whilst Goldie retains only the first, second, and third varieties of Bateman's arrangement, Wilson has divided the varieties of purpura into *simplex*, *hæmorrhagica*, *urticans*, *senilis*, *cachectica*, and *febrilis*.

7. The *exudation* of blood in minute spots, or in larger patches, from the capillary vessels of the integuments, constituting either petechiæ or ecchymoses, takes place in the superficial layer of the dermis, or beneath the epidermis, especially when it forms merely petechiæ; and in the cells of the corion, or even in the subcutaneous cellular tissue, particularly when it appears in the form of vibices or ecchymoses. The *colour* of the spots varies with the quantity of red globules in the effused serum, with the quantity of blood and with the time elapsed from the exudation. At first the *petechiæ* are usually a dark-red, and successively purple, livid, and reddish brown. As they are absorbed, or further changed, they become yellow, and at last disappear as pale yellow stains. The *ecchymoses* are not only larger than the petechiæ, but are of a purplish or darker hue from the first, the exudation of blood being greater; and they become by degrees successively blackish, reddish brown, greenish yellow, and yellowish, until they entirely disappear. The spots, whatever may be their size, are of a deeper or darker colour in the centres than in the circumferences, which latter pass into the hue of the surrounding skin.

8. I. Description. — Var. i. — Purpura Simplex. — Synon. — *Petechiæ sine febre*, Auct.; — *Phænigmus petechialis*, Sauvages; — *Porphyra simplex*, Good; — *Pétéchies sans fièvre*, Fr.; — *Roths punkt*, Germ.; — *Petechial scurvy*; — *Simple purpura*. — This variety, like all the others, although less remarkably than they, is preceded by more or less constitutional disorder. The patient has complained, and even still more complains, of languor, loss of muscular power, of weakness of the joints and pains in the limbs, increased on slight exertion. The complexion becomes pale and sallow; the pulse is weak, soft, and excitable; the tongue is loaded, and its edges often marked by the impressions of the teeth; the bowels are confined, the stools offensive, and the urine loaded, or thick upon cooling. The appetite is impaired, and sometimes there are nausea and headach. The petechiæ and small ecchymoses, usually attending and characterising this variety, may affect the surface either partially or more or less generally. When partial they are limited chiefly to the lower extremities, or affect also the upper. But very frequently they are numerous on the insides of both the lower and upper extremities, and on the breast, neck, and abdomen. They vary in size from a minute point to that of a pea, are rounded, do not disappear on pressure, and are not attended by itching, nor other uneasy sensation. They may be either simultaneous in their appearance, or nearly so, or successive; in the former case the tints they assume may differ little; in the latter the hues of each point, or spot, vary more or less with their respective durations. The face is often free from them; but if they appear there they are usually observed also in the conjunctivæ, and in the mucous membrane of the mouth and fauces. Their *duration* varies, as they are simultaneous or successive in their appearance, being usually two or three weeks in the former case to as many months in the latter. When this variety is neglected it may pass into the next.

9. Var. ii. Purpura Hæmorrhagica. — Synon. — *Hemorrhagia Universalis*, Wolf; — *Morbus maculosus Werlhoffii*, *Morbus maculosus hæmorrhagicus*; — *Porphyra hæmorrhagica*, Good; *Pourpre*, *Hæmorrhagie pétéchiale*, Fr.; — *Land scurvy*. — This variety is often *preceded*, for some weeks, by great lassitude, and by the constitutional symptoms now enumerated (§ 8.), but in a more marked degree. In some instances it occurs much more suddenly. It is always, however, accompanied with extreme debility and depression of spirits; by marked disorder of the digestive, assimilating, and depurating functions; by morbid states of the evacuations; by a feeble, soft, compressible, and excitable pulse; by slight chills alternating with flushings or perspiration; by pallor or sallowness, or duskiness of the skin; and by a loaded, flabby tongue, and spongy state of the gums. In some instances the hypochondria are distended; syncope or faintness is complained of; or the extremities swell when in a depending position. The breath is fœtid, and the odour of the body is offensive. Pains in the limbs, or about the præcordia, back, or abdomen, are not infrequent. The pulse may be slow, or of natural

frequency; but it is readily excited. More or less emaciation is commonly observed.

10. The petechiæ, in this variety, are interspersed with ecchymoses and vibices, sometimes with livid stripes or patches, resembling the marks left by bruises. They commonly appear first on the legs, and, at varying periods afterwards, on the thighs, arms, and trunk of the body. The hands are seldom spotted with them, and the face is generally free. They are usually of a bright red colour when they first appear, but they soon become livid or purple, and when they are about to disappear they change to a brown, greenish yellow, and pale yellow hue. When they arise successively, then the surface presents a variety of colour. The cuticle over them is smooth and shining, but is not sensibly elevated; in rare instances only has it been raised, or assumed the appearance of a vesicle containing dark blood. This appearance has more frequently been observed as regards the spots in the gums, cheeks, palate, and fauces, where the slightest force ruptures the epithelium and allows the blood effused to escape. Slight pressure also in any part of the surface often produces the exudation of blood, and ecchymoses and vibices in that part.

11. In connection with this disposition to exudation of blood in the integuments, there is a still more marked disposition to exudation of this fluid, and often in large quantity, from the internal surfaces, especially the mucous. These hæmorrhages are not only sometimes profuse, but are also restrained with difficulty, and are even occasionally suddenly fatal. In a majority of cases, however, they are less abundant; and in a few instances they have recurred daily at stated periods. Other cases present only occasional and irregular effusions of blood; and some are attended by an almost constant oozing. The bleeding occurs most frequently from the gums, cheeks, fauces, tongue; from the stomach and bowels; from the kidneys, bladder, uterus, or vagina; from the nose, bronchi, or lungs; and more rarely from the conjunctiva and external ear. There is the utmost variety as to the period of the disease in which the hæmorrhages commence and cease, and as to the proportion which they bear to the exudations in the integuments which chiefly mark the character of the diseases, in connection with the general disposition to hæmorrhage.

12. The *duration* of this variety is extremely uncertain. It may continue for weeks or months, and even, in very rare instances, for years; and at some period, especially upon sudden exertion or excitement of the circulation, hæmorrhage may occur to a profuse, dangerous, or even fatal extent. When the disease terminates fatally, the result is to be imputed to the amount of hæmorrhage, internal or external, or to the vital exhaustion more slowly caused by a continued oozing of blood; and, in this case, emaciation, œdema of the extremities, and occasionally serous effusions into either of the shut cavities, precede dissolution.

13. VAR. iii. PURPURA URTICANS. — SYNON. — *Porphyra urticans*, Good. — *Nettle-rash Scurvy.* — This variety is merely a rare modification of the first. It is distinguished by commencing in rounded reddish elevations of the cuticle, resembling the small weals of urticaria, but it is not attended, like them, by any tingling or itching As these small weals dilate they subside to the level of the surrounding surface, assume a darker, and at length a livid hue. As they generally appear in succession, in different places, they present different tints; the more recent being of a brighter colour, the older spots being level, and of various degrees of lividity. They are most frequently seen on the legs, mixed with petechiæ, but they sometimes also appear on the thighs, arms, and breast. The *duration* of this variety is from three to six weeks. Hæmorrhages very rarely occur in the course of it. This variety sometimes attacks delicate young females, and in them it is generally attended by some œdema of the extremities. In one case, which occurred in a young lady under my care, it soon disappeared after an attack of menorrhagia and the treatment adopted for this attack.

14. VAR. iv. *Purpura senilis.* — SYNON. — *Senile purpura.* — *Scurvy of old age.* — This variety is rarely met with, and occurs chiefly in aged females, who live on a poor and insufficient diet. It appears principally on the legs and fore-arms, in successive dark or purplish spots or blotches, of irregular forms and various sizes. Each of the spots continue from ten to fifteen days, when the exuded blood is absorbed, and they disappear; but a repeated series of these blotches may continue to appear for months or even years. The health does not appear to suffer so much in this variety as in the preceding. I have not seen among several cases that I have observed, one instance of hæmorrhage supervening in the course of this variety. DR. BATEMAN states, that he has met with this affection only in elderly women, and on the outside of the fore-arm. I have seen it sometimes in elderly males, and more frequently in the legs than in the fore-arm.

15. II. COMPLICATIONS OF PURPURA. — The complications of purpura are extremely diversified; for, not only may this change in the skin supervene in the course of the adynamic and malignant states of fever, but it may be almost, although in very rare instances, co-existent with fever, the purpura assuming a *febrile character*, and not being merely a contingent phenomenon in the advanced progress of fever. Moreover, even the non-febrile purpura may be complicated not only with hæmorrhages, from mucous surfaces, and into various structures, but also with various states of visceral lesion. It will be useful to notice these several associations more fully.

16. i. *With fever.* — *Purpura febrilis.* — *Exanthema hæmorrhagicum*, GRAVES. — This complication of purpura may be *sporadic* or even *epidemic*, as shown by LORDAT, LATOUR, RAYER, and others. *Febrile purpura* may attack persons of all ages and of every state of constitution. It usually commences with great lassitude and a feeling of vital depression, by chills or rigors, followed by heat, pains in the back and limbs, headach, a sense of oppression or of heat over the body, by nausea, retching, and by rapid pulse. Petechiæ and ecchymoses appear from the third to the sixth day, sometimes without hæmorrhage from the mucous surfaces — *purpura febrilis simplex*, sometimes with such hæmorrhage — *purpura febrilis hæmorrhagica.* — In most cases, the more or less fever precedes the change in the skin, for a few days; very rarely is the fever and the purpura nearly simultaneous; and not unfrequently, with the vascular reaction characterising the febrile attack, or about the

or third day, exanthematous patches, resembling urticaria, first appear, and are followed by purplish petechiæ and ecchymoses. Hæmorrhage, from the mucous surfaces seldom occur in febrile purpura, until the characteristic change has taken place in the skin, the hæmorrhage being consequent upon the purpura, as the purpura usually is on the fever; both forms of sanguineous exudation being strictly symptomatic of the fever, or complications of it.

17. The *duration* of this complication is usually from fourteen to twenty-four or thirty-one days; but it may terminate *fatally* at an earlier period, and seldom later than the twenty-fourth day. This event generally takes place in consequence of hæmorrhage from the bowels, the stomach, the lungs, &c.; or into the substance of an organ, as the brain, lungs, spleen, &c.

18. ii. *The cachectic association* of purpura is the most frequent; indeed purpura is eminently a cachectic malady, proceeding from causes which affect the vital tone and condition of the tissues, and consisting of changes not only in the condition of the textures, but also in the state of the blood. This cachectic habit of body both precedes the purpura and attends it, and favours the occurrence of hæmorrhage, which so frequently takes place, and is one of the most important complications of the malady. The evidence of cachexia is, however, not limited to the supervention of hæmorrhage, but is supported by the appearance of the countenance, of the cutaneous surface, even before the purpura appears, by the states of several assimilating and excreting functions, and by the condition of the whole frame.

19. iii. *Visceral complications* are very common, especially in the more chronic and severe cases. Very few of these cases are unconnected with functional or structural disease of the liver, or spleen, or both. I have repeatedly seen purpura, even in children, associated with great enlargement of the spleen; and in these cases the cachectic appearances have been most marked. I have seen, also, purpura follow protracted intermittents, the abdominal viscera being also more or less diseased; and in rarer instances associated with chronic diarrhœa, and enlargement of the mesenteric gland.

20. iv. The *hæmorrhage in purpura* occurs chiefly in the variety denominated hæmorrhagica, and but rarely and contingently in the other varieties. It appears most frequently as epistaxis in children and young subjects; as metrorrhagia in females; and as intestinal and pulmonary hæmorrhage in adults. When it takes place from the mouth or gums, it is often associated with bleeding from the edges of the tongue, from the fauces, and from the nose. Hæmatemesis is also then not infrequent. When purpura occurs at an advanced age, it is often attended by hæmorrhage from the bowels, or urinary organs.

21. v. The *appearances of the blood and urine.*—(*a.*) The chief changes in the *blood* consist in the physical conditions and appearances of this fluid, rather than in its chemical constitution, which, however, is so far altered, that a very marked deficiency of fibrin has been ascertained. I have treated several — indeed many, cases of purpura, but I never had occasion to bleed one. The appearances of the blood, which has escaped, furnish no small proof of its condition. Cases, however, have occurred, in which blood has been taken from a vein; but these cases have been attended either by signs of vascular plethora, or by excited vascular action — states likely to change the blood, or at least to be connected with a condition of the blood, very different from that which usually exists in this malady. In a case of marked purpura hæmorrhagica, where much blood was lost, recorded by Dr. DUNCAN, the blood, while flowing slowly from the vein, resembled diluted arterial blood, formed a loose coagulum, from which no serum separated; the coagulum being like jelly, tremulous, transparent, and colourless, the colouring matter having subsided to the bottom of the vessel. In other cases detailed by JEFFREYS, GAIRDNER, FAIRBAIRN, and COMBE, the blood was pale, coagulated slowly, formed a tremulous jelly, separated no serum, and nearly resembled that described by Dr. DUNCAN. The blood which I have observed in the hæmorrhages occurring in the course of the disease, did not coagulate, and appeared without fibrin and vital crasis, and deficient in hæmatosine.*—(*b.*) The *urine*, in the cases where I have had an opportunity of observing it, was generally of a dark colour, emitting an ammoniacal odour, and usually presenting an alkaline reaction. It appeared to contain much of the earthy phosphates, and soon became offensive and very alkaline.

22. III. APPEARANCES ON DISSECTION vary remarkably with the form, complication, and amount or seat of *hæmorrhage.* — *a.* The membranes of the *brain* are seen, in some instances, spotted with ecchymoses; and small clots of blood and ecchymoses of various sizes, from that of a pin's head to that of a bean, are found in the convolutions of the brain. The surfaces of the ventricles present small petechiæ, and these cavities contain much serum. In some instances, the effusion of blood within the cranium is in larger quantity, forming one or more large coagula, the patients having died comatose or apoplectic, with or without palsy. The mouth, fauces, and pharynx, and often also the œsophagus, are covered with black spots and ecchymoses. — *b.* The external surface of the *lungs* is often thickly studded with ecchymoses. This organ is commonly congested with dark blood, and parts of it sometimes present circumscribed engorgements; and in rarer instances circumscribed hæmorrhage into its substance, or pulmonary apoplexy. — *c.* The *pleura* and the *pericardium* also often present numerous ecchymoses or livid patches. The substance of the heart is often somewhat soft and easily torn.—

* In a case of this disease, the blood discharged from the mouth was examined by SIMON. It contained much saliva, and some flocculi of mucus, but no fibrin. It had a faint disagreeable smell, was of a dark (almost black) red colour. It was composed of—

Water	948·889
Solid residue	51·111
Fat	1·377
Albumen and mucus	34·032
Globulin	5·610
Hæmatin	0·102
Alcohol-extract, bilin, and salts	4·635
Water-extract, ptyalin, and salts	2·553
Biliverdin	0·966

In a case analysed by ROUTIER, in 1000 parts he found

Water	796·244
Solid constituents	204·756
Fibrin	0·905
Blood-corpuscles	121·701
Residue of serum	83·466

—(SIMON'S *Animal Chemistry*, by DAY, vol. i. pp. 316—319.)

d. The *serous*, and, still more, the *mucous membranes* in the abdomen almost always exhibit ecchymoses or patches of exuded blood; the mucous epithelium, and even the membrane itself, being detached or softened in parts.—e. The *urinary surfaces* are sometimes similarly changed.—*f.* I have seen the *spleen* remarkably enlarged and softened; and the *liver*, also soft, friable, and of a pale hue. The most remarkable change, and one which has not been sufficiently considered, especially with reference to the pathology of the disease, is the general want of vital cohesion, or the softening and friability of the tissues, which exist immediately after death.

23. IV. DIAGNOSIS. — It is scarcely requisite to advert to the *diagnosis* of this malady. Its external characters mark it sufficiently; and when it assumes the features of hæmorrhage on the one hand, or of scurvy on the other, the pathological condition is that which should be recognised, and not the nosological distinction. In *scurvy*, however, the gums are more prominently affected, and the ecchymoses are most evident on the extremities, and are larger. (See *art.* SCURVY.) Adynamic and malignant fevers, continued and exanthematic, are often accompanied with petechiæ or purple spots or patches, identical with those of purpura, and sometimes also with hæmorrhages; but these maladies retain their own distinctive or specific characters, and proceed from determinate causes, which are entirely unconnected with this disease.

24. V. PROGNOSIS. — *Purpura hæmorrhagica*, which shows itself by ecchymoses on the skin, is a more serious disease than that which appears by petechiæ; and even this latter form is more dangerous than *purpura simplex*, or purpura without hæmorrhage. RAYER observes that *purpura febrilis* and *hæmorrhagic fever* are less serious than those forms of *hæmorrhagic purpura* which commence without fever, but become febrile after hæmorrhage has recurred several times; and that a small, hard, and very frequent pulse — from 130 to 140 in a minute — is often precursory of a renewal of the hæmorrhage, or of other serious symptoms.

25. Ecchymoses on the nose are often followed by profuse epistaxis; palpitations or oppression in the chest, with or without cough, are frequently followed by hæmoptysis; and pulsations in the epigastrium by hæmatemesis. If these hæmorrhages recur often; if the blood does not coagulate, or is thin and watery, or exhibit a sanious appearance; if the signs of cachexia are manifest, and if those of anæmia are also present; if the pulse be very small, rapid, or weak; if the bowels become relaxed with black or bloody evacuations; if the matters vomited present a black, grumous appearance; if the evacuations be attended by faintness, or by syncope; if hæmorrhage take place from the tongue and from the urinary organs, the danger is great, and the patient should not be allowed to assume, especially suddenly, either the sitting or standing posture, or to make the least exertion. All the evacuations should be passed in the recumbent position, lest fatal syncope take place on passing them. If a prompt and decided treatment fail of affording relief in cases attended by one or more of these symptoms, the danger ought to be viewed as not only great, but also imminent. The occurrence also of lethargy, or coma, or apoplexy, especially when the case has been unattended by external hæmorrhage, is generally fatal.

26. VI. CAUSES.—This malady occurs at every period of life, and in both sexes; but most frequently in women, and in boys before the age of puberty; especially those of delicate constitutions, who live in cold, humid, and miasmatous situations, or in low damp cellars, or in apartments which allow the dampness or exhalations from the soil to pass through them, and in houses which have no cellars or sunk areas. It affects chiefly, also, those who live in close, crowded, and ill-ventilated lanes, closes, or houses; who are employed in sedentary occupations, in close and densely inhabited towns; who suffer from mental anxiety, the depressing emotions, from fatigue and want of sleep; and those more especially who live on a poor, innutritious, or unwholesome food, or who have too little food. It may attack those, also, who live too exclusively on animal food, and deprive themselves of a sufficient quantity of fresh vegetables and fruits. It was remarkably prevalent during 1846 and 1847, when the crops of potatoes and of vegetables were generally blighted and scarce; potatoes and other vegetables, farinaceous food and milk, in due quantity and proportion, manifestly tending to preserve the blood in a state incompatible with the existence of purpura and scurvy.

27. Purpura has also followed other diseases, or appeared during convalescence from them, especially from small-pox, measles, scarlet fever, and affections of the liver or spleen; and in children after various disorders of the digestive organs. It has also followed remittent and intermittent fevers. It has occurred, however, in persons previously healthy, and in those who have appeared to live well, and in healthy localities; but I suspect that even in these the modes of living may not actually be wholesome; that too much animal food is habitually partaken of, either absolutely or relatively, to the proportion of vegetable substances, and that the animal food is not always of the most wholesome kind; that it is either imperfectly preserved or cured, or consists of pork, veal, and other indigestible or hurtful articles, or of the blood or viscera of animals; and that, in connection with an excessive use of animal food, congestion and oppletion of one or more of the internal viscera, especially the abdominal viscera, are produced. Hence the relief often observed to follow losses of blood in the course of purpura, and, in some cases, the entire disappearance of the disease after such losses. Purpura is said to have been hereditary in a few instances; it may even be epidemic, or endemic in some parts; and instances of its prevalence as an endemic and epidemic have been recorded. The nature of the causes will readily account for such manifestations of it on some occasions, especially when several of these causes concur to produce it.

28. VII. TREATMENT. — The *treatment of purpura* depends essentially upon the habit of body and age and strength of the patient. If the patient be plethoric, and the pulse full and strong, or if evidence of visceral congestion or oppletion exist, and if the purpura be simple or not complicated with hæmorrhage, or if the hæmorrhage has been inconsiderable, a moderate blood-letting will then be of service; but the disease may be removed without it; and it ought not to

scribed if there be evidence either of anæmia, or of deficient crasis of the blood. By bleeding in these circumstances, we do not only diminish the already deficient proportion of blood globules, and the impaired vital crasis of the blood, but we also lower the already depressed vital tone of the vessels; and we also disturb, or even altogether overturn, the mutual dependence subsisting between the blood-vessels, especially the capillaries and their contents. If we at all base our treatment upon the pathology of the disease, bloodletting will rarely be required, and only in moderation, in the circumstances just mentioned; and probably, also, when the cases thus circumstanced have presented somewhat of a febrile character.

29. *Viewing the disease as essentially dependent upon impaired vital tone, and cohesion of the capillaries and of the several tissues, with more or less manifest change in the blood, either proceeding from, or connected with, impaired assimilation and excretion* (§§ 26, 27.), I have hardly ever directed vascular depletion, but have prescribed those remedies which appeared to me the best suited for the removal of these pathological states; and I have never found, in the many instances in which I have prescribed it since 1817, the *oleum terebinthinæ* fail in removing the disease, when prescribed in a suitable form or dose, or in such combinations as the peculiar features of the case required. Numerous other means will often succeed in curing this malady; but there is none so efficacious as this in the hæmorrhagic states of the disease, and none which will be more beneficial conjoined with purgatives, in the several circumstances requiring a purgative treatment. If we wish to arrest the hæmorrhagic disposition, the turpentine should be given in doses varying from half a drachm to a drachm, three or four times daily; and, if the vital powers be much depressed, a few drops of tincture of capsicum, or of some aromatic tincture, may be conjoined with it. If it be more desirable to act upon the bowels, then it may be prescribed in much larger doses, with castor oil on the surface of an aromatic water, or in any other mode; or it may be administered similarly conjoined in enemata. If the exhibition of it by the mouth produce *vomiting*, this occurrence may prove salutary, or may even be promoted, as tending to emulge the biliary ducts, and to remove congestion of the abdominal viscera. If, on the other hand, it should be preferred neither to risk nor to produce this effect, or even the unpleasant sensations which it may produce when thus exhibited, then the administration of it in enemata, in moderate doses, with a few drops of tinctura opii, or with a drachm or two of tinctura camphoræ comp., repeating the enemata frequently, or according to the period of their retention, and to their action on the bowels, will be very beneficial. If the patient complain of abdominal pains and flatulence, epithems of turpentine, or liniments or embrocations containing it (see Appendix, Form 295—297. 311.), may be applied over the abdomen, or frictions with these may be directed.

30. Many other remedies will be found more or less serviceable in the various states of purpura. When the disease is complicated with enlarged spleen, or when there is manifest *anæmia* produced by losses of blood, and especially when the attendant hæmorrhage has been restrained by the turpentine as advised above, then the preparations of iron will be most beneficial. The tincture of the sesquichloride of iron may be given either alone, or with an addition of hydrochloric acid, in the infusion of calumba; or the sulphate of iron may be conjoined with the sulphate of quina, camphor, and as much of the purified extract of aloes as will act sufficiently on the bowels, this latter, when conjoined with the quina, operating sufficiently in very small doses. These and other tonics may likewise be prescribed with purgative salts, and with the acids which are compatible with them. If the functions of the *liver* are torpid, the nitro-muriatic acids may be given in tonic infusions; and even a dose of a mercurial may be prescribed occasionally. In these cases, and especially when the purpura is associated with congestion of the abdominal viscera, a full dose of calomel, with an aromatic, should be given at bed-time, and either a turpentine or castor oil draught, or other purgatives, with tonics, the following morning and day, until the bowels are freely evacuated. The compound infusion of roses, with either of the sulphates and a tonic tincture; or the compound infusion of gentian, with the sulphate of magnesia, sulphuric acid, and tincture of orange-peel, or similar combinations, may be prescribed with this intention, and repeated according to their effects; the calomel being also repeated if the congestion continue.

31. In the *febrile state*, as well as in other forms and complications of the disease, the decoction of cinchona may be directed, with liquor ammoniæ acetatis, the acetic acid being in excess; or the same decoction may be conjoined with the chlorate of potass, or with the hydrochloric acid, the hydrochloric æther, and tincture of serpentaria, purgatives being employed from time to time, according to the state of the case. Purgative enemata also may be occasionally employed, especially those containing the spirit of turpentine. In some instances, I have found the decoction of cinchona and tonic infusions more serviceable when conjoined with small doses of the nitrate of potash and carbonate of soda or of potash. The treatment I have advised for the more asthenic forms of Hæmorrhage (§§ 45, *et seq.*) will also be found appropriate to this disease; and that for Scurvy will often prove as successful in this as in that malady.

32. The *diet* and *regimen* during the treatment requires attention. The *causes* (§ 26.) should be avoided as much as possible; and the food ought to be light and digestible. Milk should be freely allowed, in conjunction with rice and farinaceous articles. Animal food ought to be partaken of sparingly, and fresh vegetables and fruits freely allowed. The beverages may consist of lemonade, or of diluents rendered pleasantly acid with lime juice or pomegranate juice. Spruce-beer, especially the Dantzic spruce; seltzer water, soda water, with sherry or hock, or seltzer water with milk, or water made pleasantly acid with raspberry vinegar, will generally be both agreeable and beneficial.

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1. PUS — *Pus*, Fr.; — *Eiter*, Germ. — is a morbid secretion, from an inflamed or otherwise altered animal tissue or tissues, depending upon a change from the healthy state of the capillaries of the affected part, and probably also of the organic nerves supplying the capillaries and tissues implicated. It is one of those pathological formations which is foreign to the œconomy, and is incapable of organisation, beyond that which it already possesses in its independent cells. Its pathological relations are fully considered in the articles ABSCESS, DISEASE (§§ 131, *et seq.*), and INFLAMMATION (§§ 44, *et seq.*); but since these were written recent microscopic researches have thrown further light upon the constitution of this fluid, although much yet remains to be determined respecting its relation to the blood in the capillaries of the parts, upon or in which it is formed.

2. In order to understand recent views respecting pus it is necessary to premise the principal topics connected with the *cell-theory* of formation, nutrition, and morbid fomentations, which has very lately been promulgated in Germany. According to SCHWANN, the author of this theory, development is always dependent upon a formation of cells in an amorphous *plasma*, which, when giving rise to organised formations, or the production of cells, either in independent forms, as in the fluids, or variously continuous or coalesced, as in the several tissues, he has termed *cytoblastema*, or, for brevity, *blastema*; and the formation proceeds in this manner, according to the description of VOGEL. In the first place, one or more minute granules — *nucleoli* — appear, around which the cytoblast — *nucleus*, — is formed; and this again becomes surrounded by a membrane — the *cell-wall* — which at first closely envelopes it — the nucleus; but subsequently the cell-wall, in the course of its growth, becomes separated from the nucleus, thus leaving a cavity between them. This is termed the cavity of the cell, and is filled with a substance differing essentially in character both from the nucleus and from the cell-wall. In the cell thus produced, the nucleus is not in the central point, but is situated eccentrically at a point on the inner surface of the cell-wall. It is from these cells alone, by a process of further development, that all organised products arise.

3. That this mode of development from cells takes place in morbid as well as in normal formations may be readily shown in numerous cases; and, as VOGEL remarks, can be most obviously traced in the formation of pus corpuscles. SCHWANN describes the corpuscles of pus as peculiar cells which are formed in the serum of pus — the *cytoblastema*, exuded during inflammation, in increased quantity and of anomalous composition, — precisely in the same manner as mucus-corpuscles originate in mucus, and, indeed, as all cells form in their cytoblastema. Pus corpuscles appear to be earliest formed upon the surface of the granulations, owing to the circumstance of the pus-serum — their cytoblastema being constantly exuded at that part, and with the greatest amount of plastic force. SCHWANN considers it most likely that the nuclei of the pus-corpuscles are first formed, and that the pus cells pursue an independent growth for a period. The more healthy the pus, the greater is its plastic force, and the greater the number of cells which are formed in it, so that in healthy pus the quantity of serum is small in comparison with the number of cells.

4. VOGEL states, that when pus is produced from a fluid blastema on a free surface, or in a cavity connected with the exterior of the body, numerous isolated granules are first seen, and that these granules become surrounded by a very delicate transparent cell membrane, which subsequently forms so thick and opaque a wall that the nucleus can no longer be seen through it; but the addition of acetic acid, which either dissolves the cell-wall, or renders it transparent, again renders the nucleus visible. As to the early relations of the nucleus and nucleolus, he cannot determine whether or not the nucleolus exists prior to the nucleus — that the nucleolus is, as it were, the means of forming the nucleus in the same way as the nucleus forms the cell. In some cases he thinks that this may happen, but certainly not in all. VOGEL agrees with HENLE, in opposition to REICHERT, in believing that SCHWANN's cell-theory represents only one of the various forms of development, of which the type in different cases may present very numerous differences. The English reader will find this theory developed in Mr. HENRY SMITH's Translation of SCHWANN and SCHLEIDEN's researches for the SYDENHAM Society, and this and other pathological subjects fully discussed in Dr. DAY's very excellent translation of, and additions to, VOGEL's *Pathological Anatomy of the Human Body*, where the pathology of *pus* is ably considered and at great length. The recent literature of this formation is abundant; but there is nothing furnished by the numerous authors who have written on it essentially different from the results furnished by SCHWANN and VOGEL.

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10. If the malady ceases to make further progress, and tends to a *favourable result*, a vivid red circle appears around the eschar; the swelling, which had spread extensively, diminishes at the same time, and the patient feels an agreeable warmth, accompanied with a pulsating motion of the affected part. The pulse acquires power, the strength and spirits increase, and, if febrile re-action is considerable, it is resolved by a gentle perspiration. Suppuration takes place between the living and dead parts; and the detachment of the eschar leaves a suppurating surface of various extent in different cases.

11. *C. Malignant pustule, with fatal contamination of the blood and viscera*, advances with frightful rapidity, death sometimes taking place in eighteen or twenty-four hours from its invasion. The local alteration in the integuments is occasionally of no great amount; the formidable symptoms and the fatal termination are explicable only on the supposition that changes in the blood, or in the internal organs, or in both, have taken place to an extent incompatible with the continuance of life. M. RAYER has adduced two cases of this form of the malady which were treated by him and examined after death.

12. *D. Certain local modifications* of the malady have been observed. When anthracion attacks the *face*, it is attended by a phlegmonous erysipelas of the features often extending to the neck and anterior of the chest. When the eyelids are the seat, it occasions an enormous and very painful tumefaction of the face, with intense headach and delirium, often with the loss of the eye, always with eversion of the eyelids, which are then formed by the orbicularis muscle and the conjunctiva alone. Wherever muscular fibres are contiguous to the skin, there the gangrene extends less deeply. Nevertheless, when the lower lip is attacked with anthracion, it is apt to be destroyed through a considerable extent, either by the disease or by the caustics employed to arrest its progress. When the *neck* is the seat of the malady, the deep extension of the inflammation impedes respiration and deglutition; and ptyalism, epistaxis, swelling of the face, &c. generally take place. If the parietes of the *chest* are attacked, the inflammation generally extends to the subcutaneous cellular tissue of the thorax and axillæ. When the back of the *hand*, or the *instep*, is the seat of anthracion, every part of the limb is successively attacked with a phlegmonous-erysipelas inflammation.

13. *E. Appearances after death.* — In the more severe and general states of the disease, unequivocal symptoms of an altered condition of the blood, of congestive inflammation of the lungs, or of asthenic gastro-enteritis, or of the absorption of purulent sanies into the blood, are observed before death. M. LITTRÉ, in a case of anthracion of the lower lip, found pus within the veins of the face, and a number of small abscesses in the substances of the lungs. In addition to the destruction of the integuments and adjoining cellular tissue of the affected part, marks of congestive inflammation, with ecchymoses have been observed in the lungs, liver, spleen, and digestive canal. M. VIRICEL states that he found malignant pustules in the colon; and M. LAMBERT says, that the gelatinous serous deposits always found in the adjoining subcutaneous cellular tissue is occasionally also found in the cellular tissue of the mediastinum. A quantity of sanguinolent serum is commonly effused into the serous cavities. The several tissues are more or less softened, and the viscera and blood present the same changes as are found in the malignant carbuncle of animals.

14. III. DIAGNOSIS. — On its first appearance the malignant pustule may be mistaken for the *bite* of an insect. But it wants the minute central yellowish point of an insect-bite; and soon presents the painful indurated base, and the sanious vesicle with which malignant pustule commences, and which, with the diffuse or erisypelatous and emphysematous-looking inflammation surrounding it, also distinguishes it from furuncle, *carbuncle, or anthrax*. Malignant pustule, in some instances, however, can hardly be distinguished from the more gangrenous form of carbuncle (see article FURUNCULAR DISEASES, &c. 14, *et seq.*); and it is most probable that the one affection runs into the other, those cases of sporadic anthracion, which have not been traced to contagion, being only instances of very severe carbuncle, the local and constitutional characters of which they have certainly possessed.

15. On the other hand, anthracion may be confounded with phlegmonous or gangrenous *erysipelas*, and with the gangrenous or sphacelating ulceration of the cheeks, and labia majora vulvæ met with in children, or even with the *bubo* or *carbuncle* of plague; and certainly cases of these occasionally very closely resemble anthracion, and if they be not seen at an early stage, or at their commencement, the diagnosis will be difficult, if not impossible, in some instances. These, however, do not present the sanious vesicle or the puriform pustule with which anthracion originates; and the gangrenous affection of the cheeks of children commences in the inside of the mouth, and extends to the skin. From pestilential carbuncle and bubo, anthracion is distinguished by the absence of the symptoms characterising plague, and by the several circumstances attending either the one or the other. Cases of anthracion, however, are not so readily distinguished, as M. RAYER supposes, from the carbuncles, in cases of sporadic or scattered plague. Indeed he endeavours to draw distinction, but conceals close resemblances, between this malady and those which are very closely allied to it, if they be not altogether identical with it. I would, however, infer that the sporadic or uncontagious cases of malignant pustule — or the affection described as such — are severe cases of carbuncle (see FURUNCULOUS DISEASES, § 14, *et seq.*); that the malignant pustule or anthracion, caused by the contact of a poisonous or morbid animal matter, consists of local changes which closely resemble the worst cases of carbuncle, and of a constitutional disturbance often of a more intense and more rapidly fatal tendency, than in the latter; and that the true anthracion or malignant pustule is generally infected by the morbid fluids of cattle, &c., and especially by the malignant carbuncle of animals, or that attacking sheep and other woolly and hairy animals, and which I shall briefly describe.

16. *The malignant carbuncle*, or *charbon*, of animals is characterised by the appearance of a voluminous uncircumscribed tumour, which yields to pressure, crepitates like emphysema, and exhales a peculiar putrid odour. The centre of the swell-

ing is black, as if carbonised, and the circumference is infiltrated with a brownish or yellowish fluid, and distended by a very fœtid gas. After death the substance of the *heart* is softened, and its external surface ecchymosed in the course of the blood-vessels. The *blood* in the heart and large vessels is generally fluid. In the veins it is very black, sometimes containing clots of a black or yellowish colour. The *lungs* are covered by small ecchymoses, which are also seen penetrating their substance. The *stomach* and *intestines* present black sanguineous ecchymoses, of various sizes, between the inner coats and under the peritoneum, and variously distributed in different parts of the canal. The *liver* and *spleen* are gorged with dark blood. The *nervous system* is said not to offer any change.

17. The same changes, local and visceral, which are found in the malignant carbuncle of animals, are also found in the blood, heart, lungs, digestive organs, and other viscera in cases of fatal malignant pustule in the human subject; and, moreover, the discharge from the disease of the brute produces the same malady in man — malignant pustule or anthracion. The identity of both these diseases cannot, therefore, be disputed, although the spontaneous or sporadic appearance of anthracion in man may be disputed, or may want confirmation.

18. IV. Prognosis.—The *first variety* may recover of itself, the gangrene terminating spontaneously, or being readily arrested by treatment. The *second* is much more serious, but it will generally be cured by the prompt and energetic use of caustics. The *third variety* is generally mortal; and it may end fatally in twenty-four or forty-eight hours from its appearance. The danger is always greater from the second variety, when it attacks the face, head, or neck, than when it affects the extremities. It is also aggravated by extremes of temperature.

19. V. Treatment. — M. Rayer states, that as soon as the existence of anthracion is ascertained, the part must be deeply scarified and extensively cauterised. To be effectual, the incisions should extend to all the gangrenous parts, but not beyond them. The vesications on the surface ought to be immediately opened and the fluid absorbed, and the denuded surface covered with a dossil of lint dipped in the liquid muriate of antimony, or with a small fragment of caustic potash, kept in its place by a strip of plaster and a bandage. Five or six hours afterwards this application may be removed, and the eschar covered with lint spread with the unguentum resinorum, or some other salve of a similar kind. Instead of the caustics advised by M. Rayer, I would recommend the *nitric acid* to be freely applied, and to be followed by the usual dressings and the internal treatment prescribed for gangrenous inflammation of the *cellular tissue* and for *carbuncle*. (See articles Cellular Tissue, §§ 35, *et seq.*, and Furunculous Diseases, §§ 20, *et seq.*)

20. Next day, if it be found that no vesicular areola has been formed around the eschar, and if the patient complains of but little pain without smarting or pungent heat, it may be inferred that the cautery has included the whole of the disease. If, on the contrary, a hard and deep-seated tumour has appeared around the primary seat of the malady, and symptoms of phlegmous-erysipelatous inflammation are present, the caustic must be applied again, having first removed the gangrenous parts, after dividing them by a crucial incision. This procedure is also necessary when the slough, which forms the centre of the swelling, has already become hard and impermeable like a piece of leather; for it must be removed to admit of the action of the caustic being exerted on parts not yet sphacelated; after which they are to be covered with a stimulating poultice.

21. The value of *escharitics* in the treatment of malignant pustule is incontestable. They are indicated as long as the gangrene shows a disposition to spread, or whilst its limits are undefined. But, in order that the constitutional or vital powers should be enabled thus to limit the extension of the local mischief, and to resist the imbibition and absorption of the morbid matters of the gangrenous part — should oppose the general infection, and contamination which the peculiar matter of anthracion produces, and the consequent congestions, congestive inflammations, and visceral lesions which are observed in fatal cases, the powerful internal restoratives, aided by the aperients and enemata, that I have recommended in similar states of constitutional and local disease should not be overlooked, but be promptly and efficiently prescribed. (See Cellular Tissue, *diffusive inflammation of*, §§ 35, *et seq.*; Erysipelas, §§ 73, *et seq.*; Inflammations, §§ 236, *et seq.*; Gangrene, §§ 66, *et seq.*; and Poisons, §§ 698, *et seq.*)

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PYLORUS. See Stomach, Diseases of.

PYROSIS. — Synon. — Πυρωσις (from Πυρ, fire, and πυροω, fut. ωσω).—*Pyrosis*, Sauvages, Sagar, Cullen; — *Cardialgia sputatoria*, Linnæus, Good; —*Ardor ventriculi*, Hoffmann; — *Soda*, *Gastrorrhœa*, *Ardor stomachi*, Auct.; — *Ardeur de l'estomac*, *Cremason*, Fr.; —*das Brennen*; *das Sodbrennen*, Germ.; — *Blackwater*, *Water-brash*, *Heartburn*.

Classif. — 2d *Class.* Nervous Diseases. 3d *Order.* Spasmodic Affections (*Cullen*). — — i. *Class.* Diseases of the Digestive Function. — i. *Order.* Affecting the alimentary Canal. — 1. Class. 1. Order. (*Author.*)

1. Defin. — *Constrictive pain at the pit of the stomach, extending to the back, and bending of the body forwards, followed in a short time by eructations, without nausea or retchings, of a large quantity of a thin, watery, and often insipid fluid, that afford relief.*

2. The *description* furnished by Dr. Cullen has generally been considered as most accurate, his experience of the disease, in a country where it is prevalent, having been considerable. But it is liable to the objections which may be urged against nosological descriptions, namely, that it represents merely a single type or phase of the disease — a single and distinctly characterised form; without any notice of the modifications and gradations which ally it to other disorders of the digestive organs. I shall first describe this affection nearly in the terms used by Dr. Cullen, and afterwards notice such variations as have fallen under my observation.

3. I. Symptoms. — *Pyrosis* appears most commonly in persons under middle age, but seldom before the age of puberty. When it has once taken place it is apt to recur occasionally for a long time after; but it seldom appears in persons far advanced in life. It affects both sexes, but more frequently the female. The fits of the disease usually come on in the morning and forenoon, when the stomach is empty. The first symptom is pain at the pit of the stomach, with a sense of constriction, as if the stomach were drawn towards the back. The pain is increased by raising the body erect, and is alleviated by bending forward. It is often severe, and after continuing for some time, it is followed by an eructation of a thin, watery, limpid, or nearly clear, and often ropy fluid in considerable quantity. This fluid is generally insipid; but it is sometimes more or less acid. The eructation is for some time repeated frequently, and does not immediately give relief to the pain; but it does so at length, and terminates the attack.

4. I may add to the above, that I have seen this affection more than once in males much below puberty; occurring at any hour of the day when the stomach was empty, and affecting patients with good appetites and rapid digestion. I have seen it also unattended and not preceded by any actual pain at the pit of the stomach, but by slight uneasiness only in that situation; and in more than one case the patient complained of the great coldness of the fluid thus ejected. The pain is quite different from that of cardialgia, or heartburn, when the fluid brought up is abundant, insipid, ropy, and colourless; but, when it closely resembles cardialgia, the sensation of constriction, with bending forwards of the trunk is not present, and the fluid rejected is often acid, and less abundant than when the pain is of the constrictive character above described. In no case is the disease attended by fever or by nausea or retchings. The fluid is always regurgitated or eructated by a similar inverted action of the œsophagus to that producing rumination. It has appeared to me, during a careful observation of some cases, that the constrictive pain, as well as the rejection of the fluid, partly may be referred to the diaphragm.

5. *Complications.* — Pyrosis may be independent of indigestion, or be attended by rapid digestion; it also may be associated with either of the forms of dyspepsia or with flatulence. It is commonly complicated with costiveness, and often with torpid function of the liver, or even with disease of this viscus. That it is often associated either with organic or with functional disease of the pancreas, seems probable. Indeed it has been long supposed, and by various writers, that the fluid thrown off is merely an excessive discharge of the pancreatic fluid, regurgitated into the stomach, and thence into the mouth; but, as Dr. Kerr has justly remarked, if this were the case, we should expect the fluid to be mixed with some bile. Besides, it could hardly be expected that so large a quantity of fluid could be furnished by the pancreas in so short a time as during a fit of pyrosis. I am not aware of any instance, in which organic disease of the pancreas has followed pyrosis, or in which such disease had taken place in a patient who had been at any previous period the subject of this affection. Dr. Seymour adduces a case in which organic change in the liver followed pyrosis; but the cases which I have observed have not been associated with any organic change, excepting in one instance, although various functional disorders have often been present. It is not unusual, especially in northern countries, where pyrosis is most prevalent, to observe it in the course of pregnancy, and in both married and unmarried females, complicated with leucorrhœa. I have seen it in one instance associated with disease of the ovaria; — and frequently in these countries with chronic rheumatism.

6. II. Diagnosis. — *Pyrosis* is readily distinguished from other affections of the stomach, by the absence of the usual symptoms of indigestion; by the appearance of the fluid ejected, — its clear, colourless, generally insipid nature, and abundant quantity; by the absence of fever, of nausea, or retchings; by the manner in which the fluid is thrown off; by the mere regurgitation without nausea; and frequently by the little inconvenience or general disturbance attending it. The eructations which often accompany *cardialgia*, or other forms of indigestion, are usually observed during the progress of digestion; the fluid eructated being generally in small quantity, and acrid, always discoloured, and often furnishing indications of the indigestible matters. When the fluid of pyrosis is at all acid or acrid, these properties are much less marked than in cardialgia, or the allied states of dyspepsia (see article Indigestion, §§ 13, 14.); it furnishes no indications of undigested matters, and is thrown up from a stomach which has digested its contents, and contains nothing but the fluids which it thus ejects. Pyrosis cannot be confounded with simple *gastrodynia*, inasmuch as the former is attended by the copious discharge of a peculiar fluid, without nausea or vomiting, and as this discharge may be abundant although the pain may be very slight; gastrodynia being only a symptom of several gastric diseases. Dr. Watt states, without however adducing his authority, that the secretion of true water-brash is composed of water, albumen, and a trace of sodaic salt, with an excess of soda; and that, when it is acid, this property is owing to the muriatic and acetic acids. A recent analysis of the fluids thrown off the

stomach has been published; but they do not appear to have been the fluids ejected by pyrosis, as they were mixed with undigested food, and contained much acetic acid. (Simon's *Animal Chemistry*, by Day, &c. vol. ii. p. 393.)

7. III. Prognosis.—Having once taken place, pyrosis is very apt to recur, and it is often very difficult to cure; but I have not met with an instance of it having passed into serious or structural disease, or been attended with danger. I am intimately acquainted with a gentleman who was long subject to this disorder when he was a boy residing in the north of Scotland, and who was afterwards frequently attacked by indigestion; but he is now well and strong at an advanced period of life. Persons who are subject to it generally are able to pursue their avocations without much inconvenience; and often continue free from it for a considerable time, without any very obvious cause, and then are attacked, owing either to some error of diet, or exposure to cold and moisture. When the complaint is prolonged, the patient frequently becomes pale, considerably emaciated, and debilitated; and when it is protracted in females, scanty, or difficult, or painful menstruation is a common consequence.

8. IV. Causes.—*A.* Pyrosis is more frequent in females than in males, and in the unmarried than in the married. It may occur at any age, after six or seven years, but it is most common after puberty and until far advanced age. It is so prevalent in some countries as to be considered *endemic* in them, especially in Sweden, Norway, Lapland, Scotland, and the Isles, &c. It has been attributed to the diet used by the natives of these countries—to the use of rye, barley, oats, potatoes, &c., and the want of animal food. It has been supposed that the use of unleavened or unfermented bread may be concerned in producing it. The share that these causes may have in occasioning it can hardly be determined. But it is also prevalent in countries where not only these causes prevail, but others which may concur with them, as the use of dried and smoked meats in considerable quantity, and of dried fish — both the dried meats and the dried fish being preserved without salt, or with very little. Pyrosis is certainly also much more frequent in cold and humid climates, than in temperate, dry, or warm countries; and among the poor and ill-clothed, than among the wealthier classes; although the latter are not exempt in these climates. Linnæus states that nearly one half of the population, men and women, living near the mountains in Lapland, were in his time the subject of this complaint, and that in some it endured through their entire lives.

9. *B.* The *exciting causes* of pyrosis are chiefly long fasting, errors in diet, tasting savoury articles of food without partaking of them — cold and humidity, especially when their influence is prolonged, and the warmth of the body is not promoted by exercise; cold applied to the lower extremities; powerful mental emotions; a poor and unwholesome diet; the privations often contingent upon a laborious life in a cold and humid climate; and the want of salutary stimuli, or of wholesome beverages experienced by persons who are thus circumstanced.

10. *C. The nature* of this complaint has been much discussed. Pyrosis has been viewed as a form of indigestion, and it is probably allied to indigestion in many instances as it occurs in this and other temperate countries; but, in northern countries, I have seen instances of it attended by powerful and rapid digestion. Dr. Pemberton viewed it as a morbidly increased secretion from the stomach, analogous to a diabetic secretion of urine by the kidneys. Some physicians imputed it to obstruction or congestion of the collatitious viscera; and in this light it appears to be viewed by Dr. Seymour. Others have considered it as actually a disease of the pancreas; this organ furnishing the fluid which collects by regurgitation into the stomach, where it causes pain and irritation followed by its expulsion. The reasons which militate against this opinion have already been noticed (§ 5.); and the analysis of the the fluid is said to demonstrate that it is not pancreatic, although this is not a sufficient proof, for the pancreatic fluid may be considered just as likely to be altered in quality as in quantity. I once considered it as not improbable that this fluid partly consists of the gastric juice; for, having observed it in persons possessed of powerful digestion, and who live on food requiring strong digestive and assimilative powers, I inferred an abundant secretion of this juice, which would not infrequently be continued to be secreted in excess, especially in circumstances favouring the determination of blood to the digestive viscera, and in the very circumstances by which I have observed a fit of pyrosis to be produced, although there existed no food in the stomach to excite the secretion of the gastric juices: or, in other words, that pyrosis is produced by the continuance of the secretion of the gastric juices after the food taken into the stomach has passed into the duodenum; and that these juices, by irritating, or otherwise acting on the stomach, cause the pain attending the disorder, the inverted action of the organ, or the regurgitation by which they are thrown off; the complaint ceasing for a time with the rejection of these juices, and returning only when the exciting causes (§§ 8, 9.), the nature of the food, or prolonged abstinence from it, or other circumstances, which may favour the secretion of these juices, without furnishing food to the stomach on which they may act, are brought into operation. According to this view, the frequent discharge of secretions, so instrumental as they are in the assimilative processes, must necessarily be followed, in protracted cases, by pallor, emaciation, anæmia, and the other complications and consequences mentioned above (§ 5.).

11. V. Treatment.—The *indications of cure* should be based upon sound views of the nature of a disease; but if these views are not to be found, we must fall back upon the results of experience as far as they may be trusted. If the above opinion, that the disease is generally produced by a diet requiring a copious secretion of the gastric juices, but that the attack is excited by the want of that supply of food which is usually furnished to the stomach, or which is required for the quantity of the juices habitually secreted, or secreted in excess under the influence of circumstances, be at all correct, the intentions of cure may be readily devised. Indeed this view, as well as the treatment, or rather the no treatment, founded on it, is not infrequently adopted by persons subject to this complaint; for they generally endeavour to prevent long fasting, rather than to cure th-

by eating, when the pain characterising an attack has commenced; for, if food were attempted to be taken at that time, unless in the slighter fits, it either could not readily pass into the stomach, or it would be rejected along with the fluid which has now occasioned a retrograde action of the stomach. According to this view, a change to a more digestible diet—to food habitually requiring a less abundant secretion of the gastric juices, and avoiding long fasting, will often be sufficient to cure the disease. This, in most places, cannot be even attempted; although a popular recourse to several articles has been recommended as substitutes for change of diet, and to prevent the ill effects of long fasting or of improper food. Thus, opium, spirituous liquors, nux vomica, canabis Indica, tobacco-smoking, and chewing, &c. are severally used in some countries with these intentions, and are more or less efficacious in warding off an attack in persons who are subject to this complaint. These substances, by allaying the morbid irritation of the nerves of the organ, diminish or prevent the excessive secretion of the gastric fluids, causing the disorder; but, as long as the diet is persisted in that causes the complaint, the continued use of these substances is required to prevent a recurrence of the disorder, and thus the remedy often becomes as great an evil as the disease itself.

12. Many systematic writers, as well as authors of works on diseases of the digestive organs, appear either to have had no experience of pyrosis, or to have observed it imperfectly, for they have confounded it with cardialgia and other forms of indigestion on the one hand, or with the more common occurrences and states of gastrodynia or gastralgia and of vomiting on the other, and have treated it accordingly. Doubtless, there is a more or less close approximation of cases of these affections to each other; still they are distinct. The *pain* of pyrosis is different from that of cardialgia, or of the more usual painful affections of the stomach termed gastrodynia, or gastralgia, and it may be so slight as to amount only to uneasiness. The *matters* brought up from the stomach are either not acid, or very slightly so, are unmixed with undigested matters, are clear and colourless, are so abundant, and are so peculiar, even as respects their low temperature, as to constitute the chief feature of the complaint. The substances ejected either by eructations or by retchings, in the ordinary forms of disordered stomach, are generally acrid, acid, or rancid; consist partly of, or contain, undigested articles; and proceed from an unloaded, or a partially loaded, as well as irritated stomach. They are often the products of excess, or are consequent upon errors of diet, and are owing to a weakened or an irritated state of the stomach. But pyrosis occurs only when the stomach is empty, after the usual diet, taken in very moderate or even in insufficient quantity, and the fluids, by which it is chiefly characterised, are regurgitated without nausea or retchings, and always unmixed with undigested matters, as already stated (§ 6.).

13. States of disorder, quite distinct in themselves, and different in their natures and characters, have thus been confounded with each other; and substances which have been found of service in one or more of these have been recommended as cures for pyrosis, although they are either altogether inappropriate, or only temporarily beneficial. Indeed, unless the chief causes of the disorder be removed — unless many of those who are the subjects of pyrosis live on more nutritious and digestible food, and are better protected from cold and wet than usually fall to their lots — no permanent advantage can be expected from treatment. Most of the remedies which have been prescribed for pyrosis, and have been said to remove it, merely alleviate the attack, but seldom succeed in preventing a recurrence of it. These medicines are generally appropriate in cardialgia, and in most cases of indigestion which are attended by acidity and flatulence, and by the eructation of fluid matters, more or less acid, or acrid, containing undigested, or partially digested substances. But these cases are not cases of pyrosis; and, although these medicines are sometimes useful in this latter affection, still they are not permanently beneficial unless they be aided by change of diet, especially by an improved diet. Amongst the remedies thus recommended, those usually prescribed for the severer forms of indigestion hold prominent places, especially absorbents, as lime-water with milk; soap with small doses of opium; magnesia with various antispasmodics, and narcotics (RANOÏ, &c.); the oxyde of bismuth, with aloes or henbane (ODIER, MARCET, &c.); and ammonia in bitter infusions. As pyrosis was thus generally viewed as a form of indigestion, and not as an affection, caused by the nature of the diet and by the influence of cold and humidity upon the surface and extremities, and independent of defective digestive power, numerous other digestive aids were prescribed for its cure; and among these I may mention, as being sometimes beneficial, the mineral acids, particularly HALLER's or MYNSYCHT's sulphuric acid — the acidum sulphuricum aromaticum, — the preparations of iron, and the balsams, especially the Peruvian balsam. Bitter almonds with ammonia and the preparations of angelica root were much praised by several German writers; and inspissated ox-gall *, with assafœtida and soap, by NIEMANN and others. LINNÆUS recommended nux vomica in powder for the native Laplanders subject to pyrosis; and most probably, if it had been long or often used, in the doses (20 grains) to which he allowed it to be carried, the remedy would have been soon found worse than the disease. (See article POISONS, § 371, *et seq.*) Dr. BAILLIE prescribed a drachm of the tincture of benzoin suspended by mucilage, and Dr. PEMBERTON, ten grains of powdered kino with half a grain of opium, every fourth hour, at the commencement of the attack; or a bolus, consisting of six grains of alum with two or three grains of the soap and opium pill, the bowels being kept in an open state by rhubarb, or other aperients. There can be no doubt of the occasional efficacy of these, and of other remedies, especially those prescribed for the more painful forms of dyspepsia (see articles INDIGESTION, §§ 49, *et seq.*; and STOMACH, *painful affections of*), when they are

* It may be mentioned that the *ox-gall* was recommended in several places of the first part of this work, and numerous formulæ, in which it formed the chief ingredient, were given in the *Appendix*. These were published in Sept. 1832; but this medicine was employed by me in practice since 1820; and was not viewed as a novelty, as it had been for centuries prescribed on the Continent. Yet has it recently been paraded as a discovery by some writers in medical journals.

aided by diet and warm clothing; but without such aids they will often fail. Change to digestible and wholesome food, due promotion of the cutaneous functions, and an open state of the bowels by means of stomachic or tonic aperients, are most deserving confidence, both for the cure, and for the prevention of attacks of this complaint, which if otherwise treated will always prove most obstinate.

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QUARTAN FEVER. See FEVER, INTERMITTENT.

QUINSEY. See THROAT, AFFECTIONS OF.

QUOTIDIAN FEVER. See INTERMITTENT FEVER.

RABIES. — SYNON. — *Hydrophobia* (from ὕδωρ, water; and φόβος, dread); — Ὑδροφοβία, Galen; *Hydrophobica passio*, *Panlaphobia*, *Aquæfuga*, Auct. Var.; — *Rabies canina*, Boerhaave; — *Rabies contagiosa*, Parry; — *Erethismus hydrophobia*, Young; — *Lyssa* (λύσσα); — *Lyssa canina*, Good; — *Clonos hydrophobia*, Parr; — *Cynolyssa*; *Phobodipsia*; *Phrenitis latrans*, Auct.; — *La Rage*, *Hydrophobié*, Fr.; — *Hundtollheit*, *Hundswuth*, *Wasserscheu*, Germ.; *Idrofobia*, Ital.; — *Canine madness*; *Rabidity*; *Hydrophoby*.

CLASSIF. — *Class* 2d. Nervous Diseases. *Order* 3d. Spasmodic Diseases (Cullen). — *Class* 4th. Diseases of the Nervous Function. — *Order* 3d. Affecting the the Muscles (Good). — II. CLASS. III. ORDER (*Author in Preface*).

1. DEFIN.—*A disease which is said to occur spontaneously or sporadically in the canine race, and is often communicated by contagion to man and other animals; and is characterised by dread of water and other fluids, by anxiety or distress at the epigastrium, by nervous spasms and choking sensations in the throat, and by paroxysms of uncontrollable impulsive violence (rabidity), terminating in death within a few days from the accession of the symptoms.*

2. Although the term *Hydrophobia* has been generally applied to this terrible disease, I have preferred that of *Rabies*, or *rabidity*, as being more characteristic of the chief phenomena manifested by it both in man and in the lower animals. The dread of water, or hydrophobia, is a very rare symptom of other diseases, which differ in every respect from the one now defined; and is only one of the phenomena observed in cases of rabies affecting the human subject. There is even reason to believe that it is not a characteristic symptom, or not always present, in cases of the disease occurring in several of the lower animals. But this topic more appropriately falls under the diagnosis. In whatever manner the poison communicating the distemper may have originated — whether the malady is perpetuated only by contagion, without the contagious virus being renewed, or generated *de novo*, by certain animals, or whether this latter alternative obtain — it propagates itself throughout animals of different species, of different races, and of distinct kingdoms — from the highest to the lowest, and probably from the lowest capable of inoculating the poison up to the highest animals; the inoculated animal acquiring a disposition by the development of the malady to inoculate others, and thereby to perpetuate itself. The slight mention which has been made of this disease before the Christian æra, and the silence of the Hebrew writers respecting it, have induced some to believe that it is more prevalent in modern times than during periods of remote antiquity. In many places of continental Europe, rabies appears so frequently in some of the lower animals, and so destructively as respects the attacks of the rabid animals on man, as to require a closer investigation of several topics connected with it than it has hitherto received.

3. *The Literary History of Rabies* has been investigated by SPRENGEL, BARDSLEY, HOFFMANN, and ADAMS. But, although many of the ancient writers, from Homer down to the commencement of the Christian æra, made allusions to, rather than special mention of, this malady, CÆLIUS AURELIANUS was the first to describe the symptoms with accuracy. CELSUS and GALEN concerned themselves more particularly with the prevention and treatment, than with the history of the progress, of the distemper; yet GALEN attempted to explain the prolonged period which the poison sometimes requires to develope its effects, and which he states to be occasionally as long as a twelvemonth. The Arabian writers add but little to what may be found in the medical works of the Greeks and Romans. AVICENNA, however, notices the affection of the urinary organs, and the occasional termination of the malady by apoplexy; whilst his description is more full than those of his predecessors. As to the prevention and treatment of the malady, the ancient writers are as instructive as many recent authors; although that which is really valuable and appropriate is often mixed up with much that is either absurd or irrational; yet not equalling the extreme absurdity and irrationality of some of the doctrines and means of the present day.

4. I. DESCRIPTION.—This disease presents well-marked specific symptoms both in the human subject and in the lower animals; yet these symptoms vary somewhat in different animals. In the domestic dog it assumes two forms — the *sullen* and the *furious*; whilst, in the feline race, it generally presents only the latter form. In some animals, the dread of water is said not to exist, at least at one period of the progress of the malady; whilst in man it is a very prominent symptom, although it frequently disappears shortly before death. Whether the disease arises only from contagion or inoculation, as supposed by some, or whether it is spontaneously evolved in certain

circumstances, in the canine or also in the feline race, and is communicated by these modes from the subject of its spontaneous evolution, as believed in by many, the period of its incubation is generally long, whilst its course is extremely rapid when it has once declared itself. These are its characteristics in all animals inoculated by the poison producing it; but there are also others which mark the *periods* or *stages*, into which it may be divided.

5. (*a.*) *Stage of incubation — the latent period.* — In this, the first stage, the symptoms of disorder may be either wanting or so slight as to escape observation. The wound, by which the distemper is usually inoculated, whether dressed or neglected, generally heals up as kindly as similar injuries; if indeed not more rapidly than they, leaving a cicatrix which differs in no respects from those usually following such injuries. In some cases, however, pain has been felt in the cicatrix a considerable time after the accident, and in a few a slight fever, or a rapid pulse has been remarked to continue from the receipt of the injury to the outbreak of the distemper. The *duration* of this period is seldom shorter than forty days, or longer than two years. Undoubted instances have, however, been adduced by M. TROLLIET, whose experience of this disease has been most extensive, in which the characteristic symptoms appeared as early as the eighth day, and he even quotes instances of their occurrence as early as the day following the injury. That the duration of this period sometimes extends to six or nine months has been satisfactorily proved. Apparently authentic cases have been adduced of a much longer time. J. HUNTER, R. HAMILTON, and S. BARDSLEY have endeavoured to show that all credible cases on record have occurred before the eighteenth month; whilst other authors have contended for even a longer period. Dr. URMAN states confidently that he has known cases to occur as late as twenty months, and four years after the injury; and similar prolonged periods have been adduced by others. In these, the question is, whether the disease has been actually inoculated at a period so far back, or has there occurred a re-inoculation at some intervening period? The solution of the doubt as to the possible duration of this period is one of some importance as respects the fears of a person who has sustained this most distressing injury.

6. The circumstances which, in man especially, seem to shorten the duration of this period on the one hand, and to prolong it on the other, have not been fully inquired into. It is not improbable that a small dose of the poison communicated to the wound will take a longer time to produce its effects upon the constitution of the injured person, than a stronger or larger dose — that the rapidity of the effect will have some relation to the virulence or quantity of the inoculated poison, and the constitutional powers of the subject. In cases, however, where symptoms of hydrophobia with spasms, &c. follow immediately or very soon after a bite, a question suggests itself, Are the symptoms actually those of inoculated rabies, or are they merely induced by the nature of the local injury, by the laceration of a nerve, by the puncture of a tendon, or by the fright or mental anxiety consequent upon the accident? This topic requires only to be kept in recollection in relation to this part of the subject, fuller consideration will be given to it in the sequel. The causes which more especially tend to hasten the development of the distemper after inoculation, are debility of constitution, previous ill-health, the fright experienced at the time, the fear and anxiety afterwards entertained, the depressing passions, venereal excesses, exposure to the sun's rays, and injuries received on the cicatrices. Whilst, on the other hand, a vigorous constitution, and absence of all dread, and of all causes of mental depression or of bodily exhaustion, probably either prolong the period of incubation, or successfully resist the influence of the poison, especially when the quantity inoculated has been small.

7. Although the period of incubation has presented no disorder, or the patient has made no complaint of any, still instances are common of more or less disorder being experienced. Still it is doubtful whether or not this disorder is caused by the silent and slow operation of the poison on the economy, or by the mental anxiety caused by the risk in which the patient finds himself placed. I am inclined to impute whatever disorder may appear to the former cause, without, however, under-rating the influence of the latter. In a case in which this period was about the duration of seven weeks, and in which but little fear of the result appeared to have been entertained, the patient gradually became more sallow than usual, the eyes more sunk, the pulse somewhat accelerated, more excitable and weaker, and he complained of general debility. In another case, in which this period was of more than four months' duration, the patient continued apparently well until shortly before the accession of the malady, when the *precursory symptoms* became well marked. In some instances, however, the patients are gloomy, desponding, retiring, and timid or melancholy, the countenance being anxious and pale or sallow; and all the digestive functions impaired.*

* About 1820 Dr. MAROCHETTI, who had visited the Ukraine, stated, that in that country the formation of vesicles or pustules under the tongue had been remarked during this period, and that, the opening and cauterisation of these pustules prevented the development of this malady. The matter has not attracted my attention in this country; but M. MAGISTEL, in France, has stated that in 1822, at Boulay, ten persons of both sexes, and some sheep were bitten by a rabid dog. The wounds, however, were not cauterised until forty-eight hours from the infliction of the injuries had elapsed. He carefully watched for the appearance of the pustules mentioned by MAROCHETTI, and he observed pustules arise, without occasioning pain, or cramping the movements of the tongue. Some of these pustules appeared on the sixth day, others subsequently, and the last on the thirty-second day. He distinguished two species, the *crystalline* and the *opaque*. The former were projecting, rounded, and the size of hemp-seed: they were transparent, and contained a limpid serous fluid. The latter were flattened, of a circular form, of the size of a lentil, and without transparency. The *crystalline* were seated superficially in the inferior surface of the tongue; the *opaque* penetrated more deeply, and presented, when opened, a small ulcerated cavity. Almost all these pustules were situated on the sides of the freenum linguæ, and on the lateral parts of the inferior surface of the organ. The crystalline appeared early in the latent stage, and not in all the persons who were bitten: the opaque appeared at a more advanced period, all the bitten exhibiting them. The cauterisation of both species was soon followed by perfect cicatrisation, and the *decoctum genistæ*, recommended also by MAROCHETTI, was perseveringly continued. Five out of the ten bitten were seized with the malady and died. M. MAGISTEL disproves the idea, formerly entertained, that ruminating animals, labouring under rabies, do not bite. Several sheep which were bitten and became rabid, endeavoured to bite other sheep which were with them.

8. II. SYMPTOMS.—(*b.*) *The precursory stage and symptoms* more immediately precede the outbreak or development of the malady, and continue for a short period merely. This stage commences with morbid sensibility of, or with pain in, the bitten part, and with alterations in the appearances of the cicatrix, which becomes painful, tender, tumid, and livid; and, according to Dr. URBAN, surrounded by small phlyctenæ containing a bluish fluid, which fluid he contends is capable of communicating the malady. This physician asserts that, although he has treated about forty cases of rabies, he has not seen the pustules under the tongue, described by MAROCHETTI and MAGISTEL; but as he wrote soon after these physicians, it is very probable that he never examined the parts at the period of the appearance of these pustules. We are, however, still insufficiently informed as to these pustules, and especially on their pathological and therapeutical importance and relations.

9. With the accession of changes in the cicatrix, and sometimes even without any very obvious change beyond a greater fulness or itching, an aching pain, resembling that of chronic rheumatism, extends from the seat of injury in the direction of the nerves. If the injury have been received in the hand it proceeds along the arm to the shoulder and to the muscles of the neck or back; if it have been received in a lower extremity, it extends along the thigh to the hips or loins. Sometimes with this pain the cicatrix becomes more irritable, of a dark livid red, and in rare instances opens up, and discharges a watery or ichorous fluid. Occasionally the pain shoots from the seat of injury to the epigastrium or præcordia, and it is often attended with headach, frequent sighing, oppression at the chest, with short attacks of difficult breathing, and with acceleration or irregularity of the pulse, which is usually soft or weak, occasionally full. The sleep is very disturbed, accompanied with frightful dreams, often concerning the animal that inflicted the injury; loss of appetite, or nausea, occasionally vomiting; slight rigors or chills alternating with flushes; constipation of the bowels, pains in the back and limbs, sunk eyes, with dilatation of the pupils, and sometimes intolerance of light. These symptoms may usher in any acute disease; but when they occur in a person who has been bitten by any animal they should be viewed with strong suspicion; and more especially if several of them be conjoined with marked timidity and increased nervous susceptibility and sensibility, with an anxious expression of countenance, with fatigue on slight muscular exertion, and continued lassitude, with unusual depression of the animal spirits and sometimes extreme sadness, with increased acuteness of the intellect and of the senses, with slight cardiac palpitation, and with the changes in the cicatrix. It has been ascertained by several physicians, as well as by myself, that the painful sensations do not extend from the cicatrix in the course of the bloodvessels or absorbents, but in that of the nerves. The absorbent glands are never affected. The *duration* of this stage varies from two days to three or four, or five, or probably to a longer period in some instances, if the commencement of the symptoms, in their slighter or incipient states, were ascertained.

10. (*c.*) *The hydrophobic period, or fully developed disease*, is attended by increase of the uneasy sensations, and other symptoms experienced in the cicatrix and extending from it, as well as of the precursory symptoms just enumerated. Added to these, there are often drowsiness, chilliness, frequent sighing, a bloated or tumid state of the face, a peculiar pain or distress referred to the epigastrium; alternations of chills and flushes of heat; a sense of constriction at the throat, with stiffness or pain about the root of the tongue and angles of the jaws, extending to the larynx and *pomum Adami*; the respiration is hurried and loud, and attempts to swallow any thing, especially liquids, are attended by pain and distress, and by spasms of the pharyngeal muscles, causing the forcible ejection of such matters from the mouth. These spasms are accompanied with feelings of distress, with epigastric suffering, and with a state of general spasm and excitement, creating a dread of swallowing fluids, although food and the more solid substances are taken with much less difficulty or distress. The alarm and suffering on attempts to swallow fluids rapidly increase; and even the idea of making the attempt, and the running or splashing of liquids, occasion the most distressing spasms of the muscles generally, but more especially of those of the throat, face, and neck; followed by sobbings, tremor, forcible respiration, and exhaustion.

11. As the malady proceeds, or about the second day, the above symptoms are more severe, and are attended by dryness of the mouth and throat; by distressing thirst, and the utmost dread at attempting to quench it; by flatulent distension of the stomach and bowels; by flatulent eructations and vomiting of greenish or dark-coloured matters; by a rapid pulse, pain at the epigastrium; and in the course of the diaphragm; by restlessness, headach, a peculiar expression of countenance, or that of alarm and anxiety conjoined; by contracted brows, staring eyes, with a wild and sparkling appearance; and by retraction of the angles of the mouth. Pains are experienced in the neck, sometimes extending along the spine, and occasionally shooting under the sternum to the epigastrium. The mouth and tongue are clammy, although a frothy saliva is secreted, and repeatedly and forcibly thrown out. A burning heat and dryness of the fauces and throat are now constant; and, with the viscid state of the saliva, increase the distress of the patient. The respiration is now hurried, laborious, or loud, and the voice, owing to the dryness of the throat, becomes hoarse; and all attempts to relieve the dryness and thirst are followed by returns of the spasmodic or convulsive paroxysms, and by signs of alarm and distress. In the advanced state of this stage, the susceptibility and sensibility of the surface are extreme; a breath of cold air, the slightest touch, a fly settling on the skin, &c., often inducing a return of the spasms. Frequent micturition is experienced, sometimes with priapism, the splashing of water, the sight of bright objects; the jinkling or rattling of glass, hardware, or metallic substances often reproducing the spasms and general distress, and occasionally also the micturition. All the senses are now morbidly acute; and light and sound become distressing. Yet the mental powers are often undisturbed, or even unusually acute, although they are as frequently slightly disturbed, especially as respects morbid impulses, and the

entertaining of suspicions or dislikes of particular persons.

12. The mental disturbance accompanying rabies may be so slight as to escape observation; it is rarely very manifest or prominent, unless during a paroxysm, when it consists of an involuntary impulse to run against any one who is opposite, and of a desire, which the patient states himself to feel, but only momentarily, and for which he expresses his regret in the intervals, of tearing in pieces who and whatever opposes him. This rabid impulse, although only momentary, distresses the patient; he struggles to suppress it, and it is often strongest against those to whom he is most attached. I have seen it in two cases; and in one, attended by Mr. DENDY and myself, the patient called out to be held, so that he might not dart upon the person opposite to him. Actual delirium is rarely present, nor is the mental disturbance greater than that now stated; nor does it often proceed further than greater loquacity than usual. In a few there is frequent muttering, unconnected talking, and even certain hallucinations or illusions, especially as respects the animal that inflicted the injury; but the patient answers rationally when addressed. These illusions sometimes excite alarms, and occasionally violent efforts to avoid the objects of them; but he is readily influenced by the friends around him, although some degree of restraint is often required during the convulsive or rabid paroxysm.*

13. The above symptoms may have all been observed by the end of the first day from the appearance of the hydrophobia; but they are more generally observed in the course of thirty-six or forty-eight hours, or by the third day. About this period, the tongue is generally clean, but dry; there is still thirst, and sometimes also hunger, which become more and more urgent. The heat and dryness of the fauces increase, and the saliva is viscid, adhesive, and, not being swallowed, owing to the distress caused by deglutition, is either forcibly thrown out, or accumulates in the throat and vicinity of the glottis, occasioning the unnatural noise during respiration, which has been fancifully likened to the barking of a dog; or it adheres to and collects about the lips, sometimes producing a frothy appearance. This accumulation of mucus in the throat, together with the distress and strangulating sensation on attempting to swallow, occasions the difficulty of breathing, or the feeling of impending suffocation, often now complained of. Restlessness, tremors, and guttural and general spasms return more frequently, are excited by the slightest causes, and are often attended by a sort of furor, or rabid violence. The sensibility of the surface and senses is extreme, and is painfully excited by the slightest contact or stimulus. The patient dislikes strangers, or dreads them; the pulse is now very rapid, small, weak, or irregular; the skin is cool, and the excretions present no very morbid appearances. Vomiting of greenish, dark, and glairy fluid, or bilious matter, often occurs, and is attended by pain at the epigastrium and flatulent distension of the abdomen. During the paroxysms, especially when the spasms affect severely the abdominal muscles, the urine is often passed involuntarily, or without control, and sometimes with erections. The blood taken from a vein, at this period, presents nothing beyond a somewhat loose coagulum, and a deeper colour than usual. The powers of life either sink suddenly, or evince a gradual but rapid depression; the debility characterising the disease from the commencement quickly passing into exhaustion from the frequent recurrence of the nervous and muscular exacerbations, or spasmodic paroxysms. At length, after one or two violent exacerbations, life is extinguished.

14. In some cases the patient suddenly becomes tranquil, and most of the symptoms subside. The hydrophobia disappears, and he can drink and eat, even voraciously. Occasionally the difficulty of swallowing still continues more or less, but the attempt is not attended by the former spasmodic attacks of suffocation, or general spasms. Still the impulsive paroxysms, or attacks of furor, may be as frequent or severe, or more so. The sound of water, of splashings, the jinkling of glass, the sight of bright objects, which excited attacks of guttural strangulation and general spasm, often with micturition, no longer distress him. This state of calm occasionally passes into more complete repose, upon waking from which, or from an apparent sleep, he suddenly expires. But more frequently he is carried off in this state of calm by an impulsive paroxysm, or general spasm, extending to the respiratory muscles, or whilst making some effort. In many cases no calm is observed, but the exacerbations or paroxysms become more violent and frequent, the debility in the intervals more marked, until life is terminated during an exacerbation. In all the cases which I have seen, the surface becomes cool, and dark or lurid, the eyes sunk, the pupils

* The following extract from the history of a case attended by Mr. DENDY and myself will illustrate this advanced period of the disease: — "The previous night was passed in a restless manner, with little or no sleep. He still talked rationally during the interval between the fits of violence, and exerted his faculties in praying more than his years (aged twelve) or knowledge promised. He was fully impressed with the idea of dissolution. The pulse was fluttering, small, weak, irregular, and about 135 in a minute. The bowels were freely evacuated: the stools were dark. The characteristic symptom, hydrophobia, had entirely disappeared: he drank a considerable quantity of ginger-beer without difficulty. The rabid paroxysms were now more frequent and severe, but of very short duration. They sometimes occurred without any exciting cause; but were induced by the mere mention of them, or by whatever excited his dislike, his sensations, or his temper. At our visit this morning, while Dr. COPLAND was making some inquiries respecting the fits of rage at his mother, on whose knee he was then sitting, he sprung forward at Dr. C. by an involuntary and irresistible impulse, which required the strength of his mother to restrain, although he expressed great attachment to Dr. C. and a desire of seeing him frequently. As soon as the momentary paroxysm had subsided, he exclaimed himself very rationally, and stated that his conduct arose from a violent impulse, and a feeling as if he could tear in pieces whatever came in his way, which was beyond the influence of his will to prevent or control. Deglutition was now much less affected, and he felt considerable appetite. He ate bread and cheese, and drank porter in our presence. But the sensibility of the surface was increased. He could not bear the least breath of fresh air; even the touch of a fly caused him distress. He sighed less profoundly, but more frequently, and his timidity and fear of strangers were greater. There was now no spasm present, unless during the act of swallowing, and then it was only perceived in the abdominal muscles in a slight degree. The vital energies of the system were much more sunk than yesterday; yet he could still walk across the room, but with an unsteady step. He complained of no pain, but of considerable uneasiness between the shoulders, when he wished the place to be pinched or pressed. The pupils were dilated, but readily contracted from the stimulus of light." He died six hours afterwards when attempting to walk out of the house.—(See Mr. DENDY in *Lond. Med. Repos.* vol. xviii. p. 296.)

dilated, and the lips and tongue livid or dark, before death, and covered by much viscid, thick, or frothy mucus. The eyes, however, retain their brightness. Dr. Bardsley states that the muscles remain rigid long after death; but in a case which I saw immediately after dissolution, the muscles presented the usual relaxation observed at that period, although the *post mortem* rigidity followed. The rigidity observed in other cases is probably the continuance of the general spasm, which sometimes terminates existence.

15. Such are the usual symptoms and progress of this advanced stage of the disease. The *duration* of it may vary from thirty-six hours or from two or three days to five or six. But it is seldom longer than eighty hours after the symptoms are fully developed. Dr. Bardsley mentions the more prolonged period of eight or nine days in a few instances; but in, these cases, the period must have been reckoned from the first appearance of the premonitory symptoms (§ 8.), the distemper rarely continuing longer than this later period from the first manifestation of precursory signs. Individual cases often present phenomena either different from the more common course above described, or in addition to them. In some, severe pains are complained of in the spine, especially the cervical region; in others, they are experienced at the epigastrium, and are attended by violent contractions of the abdominal muscles. The sensibility is always increased, and occasionally it is most remarkably great, the slightest touch, polished surfaces, strong light, noises, &c., exciting the paroxysms. The patient often perceives odours and hears sounds which others cannot perceive or hear. Magendie states that a patient who was deaf and dumb from birth heard during the paroxysm. The distress experienced about the throat is not accounted for by the appearances, which seldom are more serious than slight vascular turgescence, or redness of the mucous surface.

16. The paroxysms are rather those of spasm than convulsion, or consist chiefly of violent impulsive actions of the muscles, impelled by an uncontrollable volition; and the spasms which are excited by attempts to swallow, are accompanied with violent contractions of the abdominal muscles, of the cremasters, and of the sphincters; sometimes with micturition, by priapism, and even by seminal emissions. The pulse is always accelerated, and becomes more and more rapid with the duration of the disease; it varies remarkably in strength, fulness, and regularity; but it is usually from 126 to 150, and very weak, small, and irregular during the last few hours of existence. The breathing is at first loud or convulsive, and attended by profound sighs or sobs, and by fits of strangulation during the paroxysms. In the intermissions it is more easy, but is always accompanied with sighs, which are more frequent, but less profound, as the disease advances. The tongue is sometimes clean, more commonly furred, with a thick, viscid, or frothy saliva, and mucus adhering to its sides. A disposition to bite is certainly present in some cases, although not generally, as in the lower animals, and only occurs in the paroxysms towards the close of the malady. It is generally successfully resisted by the patient. Thirst is constant, but nausea and vomiting are less frequent. The skin is generally cool, unless during the paroxysms, when it becomes warm, or covered by perspiration; it becomes dark or lurid towards the close, and the lips purplish or livid. The bowels are generally costive, and, shortly before death, both fæces and urine are sometimes passed involuntarily. The patient is aware of his condition, of the result, and of the nature of his disease, although they may have been attempted to be concealed from him. *Death* takes place by asphyxia, caused either by complete palsy of the respiratory nerves, or by protracted spasm of the respiratory muscles, according as the degree of pressure or of irritation existing near the origin of these nerves; the respiratory functions being impaired, or otherwise affected, from the first manifestation of the malady; an aggravation of the changes inducing this affection of respiration at last suddenly extinguishing the function.

17. (*d.*) *Symptoms of rabies in the dog and other animals.*—It is of importance to know the phenomena characterising this malady in the lower animals, chiefly as respects the determination of the question as to the existence of rabidity, which the medical man is often called upon to determine. Mr. Youatt, whose experience of the disease in the dog and other animals was greater than that of any other person of whom I have heard, has described the disease as it occurs in them; and from his descriptions, as well as from many such cases which I have seen under his care, the following may be viewed as the usual course of the disease in these animals. One circumstance of great importance, much insisted upon by Mr. Youatt, is that the disease in quadrupeds is not in some respects similar to that observed in man; and that, whilst hydrophobia is never, or very rarely absent, in the latter, it is never seen in the former. Hence many think, that, because the animal has no dread of water, and does not appear wild or furious, he is not rabid; and hence he is allowed to commit further mischief, and the injured person is prevented from having recourse to proper preventive measures, which may have saved a life which is soon sacrificed to the security caused by ignorance.

18. The first symptoms observed in the *dog* is a change in the usual habits of this animal; in some there is a disposition to pick up straws, rags, bits of paper, or any small object; others are frequently or constantly licking cold surfaces, as stones, iron, or parts of other dogs with which he is domesticated. In a few instances the dog becomes attached to animals to which he was formerly indifferent, but much more frequently he exhibits a marked antipathy to strange dogs and cats. This antipathy appears very early, and is greatest to cats. The animal becomes lonely, or sullen and irritable; is less eager for, or neglects his food; but he is constantly thirsty. There are sometimes redness and watering of the eyes; the expression is suspicious, the look haggard; and the ears and tail droop. The respiration soon afterwards becomes difficult; and saliva flows from the mouth, and soon assumes the form of a viscid foam. Vomiting is occasionally observed. The rabid dog now shows great irritability or snappishness, with a disposition to bite other animals, but is still obedient to the voice of his master. He now flies at every creature he meets, but seldom attacking the human subject unless enraged. The holding up of a whip or stick never intimidates

and expectoration of a copious frothy saliva. "In the morning, the horror of fluids and burning pain in the throat were more intense, accompanied with a sense of weight in the head, hurried and irregular respiration, feeble intermittent pulse, and intolerance of light, but without alteration of the intellectual functions. He was certain that he was never bitten by any animal. The symptoms increased and he died. The examination presented nothing extraordinary. A quantity of mucus only was found in the throat." A case fully reported in the *Journal des Savans* (August, 1757, p. 81.), is referred to by Dr. BENNETT in his able treatise on this malady; and in it all the symptoms of true rabies are said to have existed, and to have terminated fatally, no other cause having been ascertained than fatigue during a hot day. This writer also refers to a case in HUFELAND's Journal, where the person was bitten five weeks before the symptoms appeared, by a dog which was perfectly healthy, and remained so after the individual bitten had died with all the symptoms of rabies. Either these persons had been inoculated with the virus producing rabies at some antecedent period unknown to themselves, or alarm and other causes are capable, on some rare occasions, and owing to peculiar combinations of causes, of producing a disease which, if the relators of these cases are to be relied upon, is identical in its course and termination with true rabies. The hydrophobic symptom observed in rare instances in hysterical, epileptic, and tetanic attacks; or in the course of exanthematous, febrile, inflammatory, or rheumatic diseases, is associated with very different groups of symptoms from those which either precede or accompany rabies, and, even when it occurs in the worst cases or forms of these maladies, it is not attended by the alarm, the violent spasms and distress extending from the throat to the epigastrium and abdominal muscles, generally observed in rabies. The symptomatic hydrophobia, observed in connection with these or with other maladies, is seldom the prominent or most important part of the disorder; and, in many cases where it has been observed, an undue importance has been imputed to it.

26. (*b.*) It has been supposed that, when the rabid symptoms follow almost immediately upon, or soon after the bite of a rabid animal, the disease is not caused by the inoculation of the virus, but by the mind of the patient. There may be some truth in this opinion, for the influence of the mind in causing, in aggravating, or in developing a malady of this nature, so greatly dreaded by every person, is undoubted in certain circumstances and in some temperaments. The mental influence strongly or uninterruptedly determined through the medium of the nervous system to a particular organ or part, especially if habitually influenced by acts of volition, will change the sensibility, painfully excite this vital manifestation, and more or less disturb every function it performs in health. But that true rabies will be produced, in a bitten person, by the influence of the mind, independently of the operation of the inoculated virus, can hardly be demonstrated, and, although not impossible, should not receive complete credence in the present state of our knowledge of the mode of operation of the poison causing the malady. Extreme or prolonged alarm may rapidly develope the action and the effects of the inoculated poison, or may have the same influence upon an inoculation of it on some previous occasion, so remote as to have escaped the recollection. I have met with three instances of ladies of a highly nervous temperament, where the mind was most anxiously and distressingly affected by rabies having occurred in their dogs, and by the circumstance of their hands or face having been licked by these favourites shortly before the disease was recognised. The animals were removed to the care of Mr. YOUATT, and soon afterwards died; and although the mental anxiety and distress of these ladies were extreme for a considerable period, and were attended by slight dread of fluids, still the symptoms were chiefly of an hysterical character, and at no time closely resembled rabies, their duration and the progress of the disorder soon demonstrating the nature of the affection, which subsided with the lapse of time.

27. (*c.*) The early symptoms of rabies may be mistaken for *hypochondriasis* or *melancholia*, especially when the injury has been inflicted long previously, or has been forgotten; but the rapid development of rabies, the precursory symptoms (§§ 8, *et seq.*), and the painful and convulsive deglutition, with the dread of water, will prevent any mistake. *Hysteria*, however anomalous its symptoms may be, or however closely it may simulate rabies, by the presence of hydrophobia, or of painful and convulsive attempts to swallow, will be distinguished from rabies, by the presence of borborygmi, by the globus or clavus hystericus, by the states of the urinary and uterine functions, by the appearance of the salivary secretion, by the vacillations of the mind and temper, and by the history and duration of the case.

28. (*d.*) The resemblance between *tetanus* and rabies is not so close as some writers have believed, especially in their fully developed states. The spasms in the latter are only occasional, continue but for a very short period, and are followed by complete relaxation — are altogether clonic. In the former they are constant, although presenting slight remissions and exacerbations — are tonic and violent. Tetanus commences and is attended with distress, or pain or anxiety under the sternum, with pain and stiffness in the muscles of the jaws, which are gradually fixed, closed, and cannot be opened. Rabies commences with uneasy or painful sensations, extending upwards from the seat of injury, with uneasiness at the pharynx and root of the tongue, and the precursory symptoms described above, the mouth opening and shutting readily. Thirst and vomiting are common in the latter, and very rare in the former malady. Hydrophobic symptoms and difficulty of swallowing are very rarely observed in tetanus; whilst the spasms occurring in rabies as rarely present the form and characters of tetanus, which, moreover, is never accompanied with the extreme sensibility of the surface and of the senses, with the rabid or impulsive paroxysms, and with the symptoms referable to the urinary and genital organs that are characteristic of rabies.

29. V. PROGNOSIS. — The opinion which may be formed as to the ultimate result, has reference — 1st. to the disease, when the symptoms, precursory or developed, have appeared; — and 2d. as to the probable occurrence of the malady after the bite of a rapid animal. — (*a.*) When even the precursory symptoms of rabies make their appear-

ance, and *a fortiori* when the symptoms are more fully developed,— are undoubtedly those of rabies, and consequent upon the inoculation of the rabid virus, I doubt the existence of a single well authenticated case which has been cured. A few instances of recovery have been recorded, but the evidence is not sufficient to convince me that they were ever caused by the inoculation of this poison, and that they were not caused entirely by fright, or more continued alarm. The fatal issue of rabies being so general, if not universal, when the malady declares itself, it may be next — (*b*) enquired, What is the prospect of escape furnished to those who are bitten by a rabid animal? The prospect varies remarkably with the species of the animal, with the seat and circumstances of the injury, with the season of the year, with the period after the injury at which prophylactic measures were resorted to, and with the nature and efficiency of these measures.

30. The bite of a rabid wolf, which generally flies at the face, is much more dangerous than that of a rabid dog. This latter animal most frequently bites through the clothes, which intercept the poison and prevent the inoculation. M. TROLLIET states that, at Brives, seventeen persons were bit by a wolf; of these ten died; and that, of twenty-three persons bit by a she-wolf, thirteen died, although in most of these precautions had been resorted to, but in many after some time had elapsed from the infliction of the injury. "Mr. J. HUNTER has stated, that one occasion a dog bit twenty persons, of whom only one was infected with the disease. In 1780, at Senlis, a dog bit fifteen persons, of which three only died of hydrophobia."—(BENNETT.) Of those persons who are bitten by the same animal, the first injured, and those who have been bitten in parts unprotected by clothes, are the most liable to become infected; the saliva, or virus, is most abundant in the first cases, and is intercepted by the clothes in the others. M. JOLLY thinks that the poison of a rabid animal is more dangerous in warm seasons and climates, than in cold or temperate periods and countries. Accidents from rabid animals, especially from dogs, are certainly more frequent in warm seasons; but it is doubtful whether or no the frequency be owing to the more frequent occurrence of rabies in these animals at these seasons, or to an increased intensity of the poison — most probably to the former circumstance. Wounds which are deep, irregular, sinuous, and bleed but little, are more dangerous than others, inasmuch as the imbibition of the poison from them is more easy or rapid, and the prophylactic measures cannot be so completely employed. When more than one injury or bite has been inflicted, when it is situated on the face, or on the neck, or on the upper regions of the trunk, the danger of infection is increased, and the rabid symptoms are more rapidly developed, the period of incubation being generally shorter. It is obvious, that the longer the period which has elapsed from the infliction of the injury to the employment of preventive measures, the greater are the chances in favour of the inoculation of the disease. As to the efficacy of those measures, more particular notice will be taken in the sequel.

31. VI. CAUSE. — *A*. Rabies being the ultimate effects of a specific animal poison, which is capable of acting upon all animals; upon every constitution, temperament, or habit of body; and upon both sexes, at all ages, and in all circumstances of climate, season, and locality, the *predisposing causes* of the malady cannot be determined. As the inoculation of a specific virus, or poison, is the only cause of true rabies, and as the inoculation may or may not have been effected in many cases of persons bitten by rabid animals, it is impossible to state with truth, that the inoculation had not taken effect owing to the predisposition of the person who had thus escaped, or that it had produced this fatal disease in consequence of predisposing circumstances in the unhappy sufferer. The most that can be said respecting predisposition is merely inferential. It may be rationally supposed that, when the quantity of the inoculated poison is great, the more rapidly will its effects be developed; that when the vital energies are strong, the longer they will be opposed; and that, when the nervous system is depressed by fear, anxiety, and other causes, the more rapidly will the malady be produced, and the more likely is the poison, even in a small dose, to take effect.

32. But, it may be asked, May not a small dose of the poison, inoculated by the teeth of a rabid animal, whether this poison consist of the saliva, or be conveyed in the saliva, or in the frothy matter in the mouth, or on the teeth and lips of the animal, fail of producing its dire effects in persons possessed of strong constitutional powers; or, in other words, may not a quantity of the poison, which would be productive of the malady in a debilitated, timid, and frightened person, fail in causing it in another person differently or oppositely constituted and circumstanced? The answer may be made, with seeming truth, in the affirmative; but we have no facts which can prove it, although the escape of many persons from the consequences of the bite, under circumstances which tended to prevent the full inoculation, or to diminish the dose, of the poison and the subsequent imbibition or action of it, appears to favour the inference. The circumstance of the full operation of the poison sometimes not appearing until months, or even years, have elapsed from the time of its inoculation, favours the idea that, in such instances, the dose of the poison is too small or weak, relatively to the powers or state of the constitution, to produce its specific action until some circumstance or change takes place calculated to aid, to determine, or to develope its influence.

33. *B*. The only *exciting cause* of true rabies in the human species is the inoculation, or application to an abraded or mucous surface, of the virus formed in a rabid animal; this virus either consisting of, or being conveyed in, the frothy saliva and mucus in the mouth, and on the teeth and lips of such animal. This I believe to be the sole cause of rabies. The very few cases of the disease which have been said to have arisen from alarm or other causes, have not been sufficiently verified in all their details to warrant the inference that rabies may appear in the human subject from other causes than the one now stated. It cannot be proved, that even in these the poison of rabies had not been communicated at some former period, or on some forgotten occasion, taking it as proved that the disease was actually rabies; and certainly most of the instances which have been adduced of spontaneous rabies have not been conclusive as to this origin. We have so many false facts in

medicine, that credence should be withheld from those which are opposed to the usual course of events, until they are satisfactorily demonstrated. One physician publishes the case of a child that died of rabies caused by the bite of a dog which, he says, was not rabid, as a proof of the spontaneous origin of this malady, or at least of the occurrence of it independently of contagion. But another physician states, that the animal which injured the child, and which was said not to be rabid, was actually killed shortly after in circumstances warranting the inference of its rabidity. The desire of publishing whatever appears singular or anomalous, chiefly from an insufficient recognition of all the phenomena, and often from the neglect of many which are most important, gives rise to an accumulation of false facts, which bewilder even when they fail of misleading.

34. It has been considered, that there is no reason wherefore rabies should not occur spontaneously or independently of contagion, because other contagious diseases occur in this manner. But other contagious diseases certainly furnish no very manifest evidence of spontaneous origin on many occasions. Syphilis, small-pox, measles, scarlet-fever, &c. present no such occurrences, and are propagated only by a specific poison, although certain seasons and epidemic influences or constitutions favour their prevalence and extension. The same is observed in respect of other contagious and pestilential maladies, which, with those now named, cannot be shown to originate *de novo* on all or any of the occasions of their appearing without contagion being traced as the cause of their appearance. It has likewise been considered that, when rabies occurs almost immediately after the bite of a rabid animal, the disease is actually not the consequence of the inoculation of the poison, but the result of alarm acting upon a susceptible nervous system, and producing a state of disturbance, which, in its characters and issue, is identical with true rabies. This is barely possible; but, because the poison requires several days, or even months, to develope its effects in most cases, there appears no reason, nor can this be considered a sufficient reason, against its immediate action in certain circumstances, such as the inoculation of a large dose of it, or unusual susceptibility of the nervous system to the morbid impression caused by it. As respects the few instances in which rabies has been said to have appeared consequent upon fright or other intense causes, and independently of the bite of a rabid animal, either the history and symptoms of the cases are deficient of precision of detail, and of a recognition of all the facts, or the probability of a previous infection, communicated in some way or other has not been disproved.

35. Much of the misapprehension existing on this subject has arisen from the circumstance of those cases of nervous or other diseases, especially those which have been fatal, and which have presented, with other nervous or spasmodic symptoms, a difficulty of swallowing or a dread of water—a *hydrophobia* — having been denominated cases of hydrophobia, and considered from this single symptom as an identical disease with that produced by the bite of a rabid animal. But to prove their identity, the communication by inoculation of the disease from these spontaneous cases to some lower animal ought to have been tried, but it has never been even attempted. That dread of water, generally depending upon difficulty of swallowing, upon disgust, or some antipathy temporarily entertained, and generally associated with spasms or other nervous symptoms, may assume a prominency in form, character, duration, and termination, to deserve the appellation of hydrophobia, cannot be doubted; and that it may, in certain circumstances of the individual affected, occur directly from the impression of various intense causes, or be associated contingently with other maladies in some period of their course, I readily admit; but I am convinced that either of these occurrences is not so frequent as supposed by some; nor is this hydrophobia, believed by a few writers to be instances of spontaneous rabies, so prominent a characteristic in such cases as it has been made to appear. Viewing, therefore, hydrophobia thus occurring, independently of the contagion of the rabid poison, as a symptom rarely observed in other maladies, and as of doubtful or very rare occurrence as a primary or idiopathic disease, I shall dismiss the consideration of it in connection with this subject.

36. Believing that rabies — that the disease described above in its fully developed stage (§§ 10, *et seq.*) — never appears in the human subject unless it be communicated by a specific virus or poison, it next remains to be inquired,—1st. What animals thus communicate it? — 2d. Do these animals generate or originate it *de novo*, or without previous inoculation or infection? — And 3d. Can the disease be communicated otherwise than by inoculation? — (*a.*) *Certain species of the canine and feline genera* most frequently inoculate the human subject with this poison; the dog, the wolf, the cat, and the fox, being the animals which most commonly become rabid and infect others by inoculation. But these other animals may, themselves being infected, communicate the disease to others, provided that they are capable, by the formation of their teeth, jaws, and mouth, of wounding the animals they may attack, and at the same time of applying to the wound the poison which may be present in their mouths or on their teeth. Ruminating and herbiferous animals, owing to the forms of their teeth and jaws, seldom inoculate the disease when they become rabid; and hence many have believed that the secretions of the mouths of these animals are not contagious But M. Bassecrt has demonstrated that the saliva of these animals, when rabid, will communicate the malady, by inoculation, to other animals. The disease may likewise be transmitted to birds of all kinds; but, owing to the absence, as respects them, of the conditions just mentioned as being necessary to this mode of communication, the individuals belonging to this kingdom of nature can hardly be considered as capable of infecting others, although the possibility of their doing so may be admitted. Of all animals the carnivorous are the most frequent propagators of the malady to others as well as to man; owing chiefly to the circumstance of these animals having preserved the contagion among themselves more especially, by the frequent inoculation of it, and to the form of their teeth, which is the most calculated for inflicting a deep wound, and at the same time for the insertion of the poison,—the lacerations, and the other wounds they inflict, not only being very readily poisoned by the fluids of the mouth, but more tenaciously

retaining the poison, in consequence of their depth and nature; and of the slight hæmorrhage or absence of all hæmorrhage characterising them.

37. The possibility of this malady being communicated by the human subject has been doubted; and experiments have been performed upon dogs, with the frothy saliva of rabid persons, by VAUGHAN, BABINGTON, GIRAUD, GIRARD, and others, in order to determine this point, but without having succeeded. More recently, however, the question has been decided by MM. MAGENDIE and BRESCHET, who inoculated two dogs with the frothy saliva and mucus issuing from the mouth of a man in the Hotel Dieu, shortly before his death from rabies. One of the dogs became rabid at the end of four weeks, and bit other dogs, which also became rabid. The result of this experiment should render persons cautious, lest the saliva or fluid issuing from the mouth of the rabid human subject should come in contact with some abraded, injured, or mucous surface of another person; as the probability of infection in this way is certainly demonstrated by it; and the statements of MM. ENAUX and CHAUSSIER, that persons have been seized with rabies in consequence of having wiped their lips with napkins or cloths which were soiled with the saliva of a rabid subject or animal, ought not to be viewed as being apocryphal, as they have been by some. CŒLIUS AURELIANUS states, that a person was attacked with this malady after having employed his teeth to undo the fastenings of a mantle worn by a person who had died of it.

38. (*b.*) *Are certain species of the canine and feline races, as the dog, the wolf, &c., capable of generating the malady* de novo, *without previous inoculation or infection, and of communicating it afterwards?* The generation of this disease *de novo* by the animals which appear to be most frequently affected by it has been believed in by the great majority of writers, yet I do not consider the matter to be at all determined. Experiments have been made by DUPUYTREN, BRESCHET, MAGENDIE, BOURGELAT, and others on dogs and cats, these animals being placed in those circumstances in which they have been said to originate rabies, without this disease having appeared in a single instance among them. This point is most difficult to be determined; and probably a just conclusion respecting it will be more likely to be arrived at by careful observation of facts and by extensive experience, than by experiments, the failure of which can prove nothing, whilst what may appear as a conclusive result will admit of cavil. The late Mr. YOUATT, a well-educated, able, and candid observer, and possessed of the greatest experience, remarked to me that he believed that the disease rarely, or perhaps never, originated *de novo*, but in contagion. It has certainly not existed for ages in certain insulated or secluded places, until introduced by inoculation on well-ascertained occasions, whilst it has never been observed in other places similarly circumstanced. The matter deserves further investigation, as serving to arrest the propagation of this distressing malady.

39. Those who believe that rabies may occur spontaneously in the dog, wolf, or cat, furnish no precise information on the subject; and it certainly cannot be proved that, when it does appear in one of those animals, it is not the consequence of inoculation or infection at some previous period. The long time often required for the development of the disease, after undoubted inoculation, and the possibility of its being communicated otherwise than by inoculation — by the contact of the virus with a mucous surface — serve to render the proof of actual communication by contagion a matter of difficulty. Those who contend for the spontaneous origin of the disease suppose that protracted thirst or hunger, extreme heat, violent excitement or anger, the sexual heat, &c., severally, or variously associated, may develope the malady, independently of contagion. Still these are merely suppositions, and are unsupported by positive evidence. M. TROLLIET states that the months of January and August, the coldest and the warmest, furnish the fewest instances of rabies; and that in March and April the greatest number of wolves are rabid; and that in May and September the greater number of dogs. Several writers have contended that the malady is very rare in very hot and very cold climates, whilst it is most frequent in temperate countries; but much uncertainty, and even obscurity, envelopes the subject of the spontaneous origin of this terrible distemper.

40. (*c.*) *Can the disease be communicated otherwise than by the bite of another rabid animal, or by the actual inoculation of the virus?* The bite of the rabid animal is merely the inoculation of the poison, which may be communicated by other modes of inoculation, as shown above. SCHENCK and ZACUTUS LUSITANUS aver that rabies has been caused by wounds from sabres with which dogs had been killed long previously. That the virus of rabies may cause the disease when brought in contact with an abraded surface, or sore, or wound, cannot be doubted; and that it may produce its specific effects if allowed to remain in contact with a mucous or an absorbing surface or part has been argued for by some, and denied by others. It has been stated that both sheep and cows have been infected with rabies after eating the hay or straw on which rabid dogs, pigs, and other animals have died; and although these and similar occurrences admit of reasonable doubts, they are certainly not impossible. Numerous instances have been recorded of a rabid animal, especially the dog, having licked the lips, the hands, or abraded parts or sores of its master or mistress, and thus communicated the disease; and it has even been stated by PALMARIUS and others, that the kiss of a rabid person has actually proved infectious to the saluted individual. That the disease may be thus communicated, especially if there have been any abrasion of the lips, or even if the foam from the mouth of a rabid animal remain in contact with a mucous surface, is extremely probable, although the facts in proof of this mode of infection are few. They are, however, so probable, and are supported by so many analogies, as to deserve attention. The instances which have been recorded — certainly remarkably few — of rabies, or hydrophobia, occurring without any bite, may have been produced by the poison of rabies nevertheless, which had been communicated in some other way than by this mode of inoculation. Authenticated instances have been published (FABRICIUS HILDANUS, HEISTER, PALLETTA, &c.) of the communication

of the malady by linen, rags, cloths, &c., which had been torn by, or imbued with the saliva of, rabid animals, and even by the cords with which these animals had been tied. The skins, fleeces, and furs of animals which had retained the saliva or foam that had issued from the mouth at an advanced stage, have even been the media of transmitting the malady, by having brought the virus in contact with an abraded or mucous surface of the infected person. Such occurrences, however, must be remarkably rare; but they are so possible as to render caution necessary, whenever an animal is in any way dealt with in this disease, or even when the existence of the malady is suspected. The statement which has been made, that the breath of a rabid animal, at an advanced stage, may communicate the malady, rests upon very insufficient evidence. The experiments of MAGENDIE and others show that the blood, milk, flesh, semen, and abdominal sécretions of a rabid animal cannot transmit the disease. As to the particular source of the rabid virus, I shall offer some remarks in the sequel.

41. VII. NATURE OF RABIES.—That the poison of rabies is not imbibed by the capillaries of the injured part and carried into the circulation, is shown by the long period which elapses from the inoculation until the disease is developed, and by the characters of the precursory and early symptoms. That it is not absorbed by the lymphatics is evinced by the absence of every sign of irritation of these vessels, or of their associated glands. It is therefore to the nervous system that we are compelled to look for the earliest changes consequent upon the inoculation of the virus. As to the pustules, said by MARROCHETTI and MAGISTEL (§ 7. *note*) to appear under the tongue from three to fourteen days, and even, in some cases, at a later period, from the inoculation of the virus, their existence may not materially affect the question as to the mode in which the poison affects the constitution. But it is by no means determined that these pustules actually exist; and, even admitting their existence, their pathological relations and nature are unknown. It is possible that they are merely enlarged, or obstructed mucous follicles; but, as such merely, their presence ought to be positively determined, and their connection with rabies investigated in its several relations.

42. The history, progress, and character of the phenomena of rabies are entirely those of a nervous malady of the most intense form. The gradual accession of the symptoms; the altered, and especially the acute, sensibility accompanying them; the readiness with which this sensibility, either of the surface or of the senses, induces, spasmodically and in paroxysms, the reflex actions of the muscles of voluntary motion, even independently of volition; the intermittent character of these actions; the marked disorder of the organs influenced by the eighth pair of nerves; and the inordinate susceptibility of the nervous system generally, combine to demonstrate an important change of that part of the nervous system to which sensibility may be especially referred, and which either gives origin to, or is more particularly connected with, the pneumo-gastric nerves. The changes more recently and most generally observed in the medulla oblongata, often extending to various parts of the base of the brain on the one hand, and to the spinal cord on the other, explain the characteristic symptoms now enumerated. It is only in comparatively recent times that our investigations have been directed to this portion of the nervous system in respect of this disease; and in all cases where the inquiry has been duly instituted, some lesion, indicative of extreme irritation or vascular excitement in this quarter, has been found. Vascular injection, ecchymoses, increased redness or congestion, serous effusion, softening of the cerebral or nervous structure, &c., have been severally observed after death. M. TROLLIET, one of the first observers who directed attention to this part of the nervous system in rabies, states that the choroid plexus is generally gorged with dark blood; that a small vascular plexus shuts posteriorly the fourth ventricle, and extends to the origin of the eighth pair of nerves and corresponding parts of the brain, which are found redder than usual; that this plexus is generally so deeply injected or coloured as to appear ecchymosed; and that the most remarkable lesions are found in the vicinity of the origins of the optic and pneumo-gastric nerves, which latter perform so important a part in rabies. A due recognition of the several functions of the pneumo-gastric nerves, and of their connections with the ganglial nerves both of the the thorax and abdomen, will serve to explain most of the phenomena of this malady. Dr. BENNETT justly observes, that a careful perusal of the experiments of Dr. J. REID (*Edin. Med. and Surg. Journ.* No. 134.), and of other physiologists, will show that congestion of the membranes at the base of the brain, producing more or less pressure on the origins of the eighth pair of nerves, is capable of explaining all the phenomena the disorder presents.

43. Certain of the changes observed after death may be directly referred to violent irritation or vascular excitement in the parts of the nervous system above mentioned; but others are altogether consecutive of these conditions, or are the results of the paralysed functions of the eighth pair of nerves, induced by the changes in these nerves, or in the vicinity of their origins; whilst there are also others which depend either upon the mode of death — upon asphyxia either suddenly or gradually induced, or upon cadaveric conditions, or most probably upon both. Several of these consecutive changes, existing either in the digestive canal or in the respiratory passages, have been viewed as the seats and origins of the malady; and, however slight, have had an importance assigned to them to which they are not entitled. Because the pharynx presented appearances of irritation, FOTHERGILL considered rabies as merely a spasmodic angina, and, as this irritation often extended to the larynx and trachea, PARRY viewed these as being chiefly concerned with the pharynx in the production of the malady; subordinate and secondary changes being thus assigned as the conditions constituting the disease. The alterations observed in the lungs, bronchi, and blood, are obviously to be referred to the lesions found in the medulla oblongata, base of the brain and vicinity, and to the consequent paralysis or similar disorder of the functions of the pneumo-gastric nerves; the circulation in the lungs and bronchial mucous surface, the secretion from this surface, and the chemical changes in the blood being thereby affected.

44. *What are the humours of the rabid animal which contain the virus perpetuating this malady? And what is the mode in which this virus acts in producing its fatal effects?* — These questions have a real importance as respects the prevention and prophylactic treatment of rabies; but they are beset with difficulties. — (*a.*) As to the *first* of these, the evidence is rather negative than positive. M. TROLLIET, MAGENDIE, and others have shown, by direct experiment and observation, that neither the blood, nor the flesh, nor the milk, nor the seminal fluid, nor the breath of the enraged animal, is capable of propagating the malady. A similar inference may be arrived at in respect of the secretions and excretions from the abdominal viscera. It is, therefore, to the secretions of the mouth, or to those issuing from this outlet, that we must exclusively look, as the vehicles of, or as the actual poison. The saliva has been viewed from the earliest period of medical history as constituting, or as conveying, this poison; and the mode of communicating the malady has been of itself a strong proof this is actually the poison. More recently M. TROLLIET has contended, that the saliva possesses no contagious properties, unless it becomes mixed with the frothy matter which is driven out from the bronchi, this latter matter constituting the poison or virus which produces the disease. He rests his opinion upon the absence of any evidence of disease, of enlargement, of inflammation, or of congestion, of the salivary glands, upon the morbid changes always existing in the bronchi of the rabid animal, and upon the analogies furnished by other contagious maladies.* — Although I consider M. TROLLIET's opinion to be deserving due consideration in all our future investigations, still it cannot be altogether admitted that he has proved the saliva, unmixed with other fluids, to be devoid of the poisonous property, or that he has demonstrated this property to be present in the secretions of the bronchial mucous membrane. Nevertheless, his investigations and his views are deserving attention, far beyond what they have hitherto received in this country.

45. (*b.*) *As to the mode in which the rabid virus acts in producing its effects*, we know nothing more than of the operation of other animal poisons, and perhaps even less. The oldest opinion, as to the action of the virus, after being received into a wound, was that it is absorbed and mixed with the circulating fluids, and that it thus produces a general infection of the humours and solids of the body. A subsequent theory ascribed its action to the effects produced in the place injured, and the propagation of this lesion through the whole nervous system. That the fluids and secretions are, generally, infected by this poison is disproven by experiments and observation; and the local effects of the injury bear no proportion to the subsequent constitutional disorder, so as to furnish an argument in favour of the opinion, that the disease arises from the propagation of the local impression throughout the rest of the system. It has already been stated, that the virus does not act by absorption, because the lymphatics and glands betray no signs of irritation, and because the bloodvessels also present no lesion. It has been supposed, that the change locally produced is propagated to the nervous system generally: but granting that this is the case, we are still at a loss to explain the production of a contagious principle, and the limitation of the production of it to a particular part and to a particular secretion. We may, however, readily conceive, that the virus affects or irritates the nerves in the part injured, and that this local change in the nerves is propagated, by means of the sensory nerves, to the medulla oblongata, or to parts in its vicinity, to which they are more especially related; that the morbid condition or change thus produced, is reflected by means of the nerves arising in these parts of the cerebro-spinal axis, to the respiratory and gastric organs, and more especially by the pneumogastric nerves; and that, in consequence of the change in the influence transmitted by these nerves, the circulation, secretions, and functions generally of these organs are altered. — As to the source of the contagious virus, the evidence is inconclusive, although it cannot be doubted, that the secretions which are excreted from the mouth actually contain this poison, and that the formation of it takes place at that period of the disease when the functions of those organs, supplied by the pneumogastric nerves, present more or less disturbance. That the succession of changes just stated is followed by the formation of a specific poison — of a secretion capable of perpetuating the malady — is extremely probable; but the exact source or seat of its formation has not been demonstrated satisfactorily. The poison is evidently contained in the fluids issuing from the mouth;

* As this is a topic of the utmost interest to pathologists, and as the lungs were never viewed, before the researches of M. TROLLIET, as the chief seat (although the consecutive seat only, in my opinion,) of morbid appearances in cases of rabies, and as furnishing the poison, the developed effects of which human science has hitherto failed to remove, I here adduce the conclusions at which he arrives: — 1st. "The organs of respiration, and the vascular system in the brain, present constant marks of derangement in rabies. The other organs offer nothing that can be rigorously attributed to this malady. — 2d. The salivary glands, and the cellular tissue enveloping them, present not the least vestige of inflammation, nor any change in their volume, nor in their colour or texture. — 3d. The mucous membrane of the mouth and pharynx are of a pale grey, and are lubricated by a slight moisture: these cavities contain no saliva, nor any frothy matter. — 4th. The larynx is rarely inflamed, the trachea more frequently, especially in its inferior portion; the bronchi always. In rabies, the capillaries of the lungs are injected; and this organ is red and congested. The sensibility of this viscus is also greatly increased; a burning heat, pain, and constriction are experienced — pathognomonic signs of inflammatory action. — 5th. This inflammatory state of the lungs is specific, and arises from the virus of rabies, as the eruption from the virus of small pox; the inflammatory appearances being present in different degrees, in different subjects. These appearances are seated in the mucous membrane of the bronchi and trachea; the cellular tissue and serous covering of the lungs being not affected. — 6th. A frothy mucus is generally found in the parts inflamed; sometimes in the larynx, oftener in the trachea, towards its lower portion; it is generally found in the bronchi, and it may be squeezed from the air-cells. This frothy matter is a product of the inflamed mucous membrane, and is driven over the lips of the rabid person in the last stage of the disease, when the respiration is quick, forcible, and stertorous. — 7th. I consider this frothy matter, thus driven, by the spasmodic expirations, from the air passages over the lips to be the true vehicle of the virus of rabies, and not the saliva; because the salivary apparatus is not the seat of any pain during the disease, and does not present any lesion after death; because the bronchi are inflamed, are the seat of pain, and furnish a diseased secretion; and because, in all contagious diseases, the virus is produced from the part inflamed; as in gonorrhœa, small-pox, &c. The saliva, therefore, is no more the vehicle of the virus of rabies, than the semen is that of the virus of syphilis."

but whether it is present in the saliva, or in the mucus secreted by the respiratory passages, as contended for by M. TROLLIET, or in the mucus secreted by the mucous follicles of the mouth, or more or less in all these, is very far from having been determined. Supposing that the poison emanates from one or other of these sources, it still remains to enquire, Does the poison consist in a material, organised, or chemical change in the secretion constituting the virus; or is the secretion merely the vehicle of a nervous aura or emanation, which is actually the infecting agent, and which is retained by its vehicle only for a short period? If this latter alternative be admitted; and if it follow, that the infecting influence is powerful in proportion to the exposure of the injured part to the mouth and teeth of the animal inflicting the injury, and is lost soon after removal of the secretion from its source, several phenomena connected with the propagation of the malady may be thereby explained. HERTWIG's experiments, however, prove the former of these alternatives, namely, that the poison is of a definite character, that it may impregnate various substances, and that it retains its activity for a long period. Possessed of these characters, the circumstance of rabies appearing without the injury or contagion being traced, in rare instances, cannot be a matter of surprise.

46. VIII. PATHOLOGICAL INFERENCES AND REMARKS.—(*a.*) The *spontaneous occurrence of rabies* in man, although believed in by some, and supported by two or three instances loosely detailed and suggesting numerous doubts, rests on no foundation of a satisfactory kind: the fear of water and the nervous symptoms present in some instances of other diseases, furnishing no approximation in character to this dreadful malady.—(*b.*) The *spontaneous origin of rabies in the dog, wolf, fox*, or *cat* is a much rarer occurrence than many believe (§§ 38, 39.). I have stated my reasons for this inference. ZIEGLER, however, assigns such an occurrence to the want of the instinctive degree of nourishment from flesh and blood by these animals, and terms the malady, *blood-thirstiness, blut-durst*, or *flesh-craving, fleischgier*. —(*c.*) The *saliva* or *secretion issuing from the mouth* of the rabid animal conveys or constitutes the poison usually inoculating rabies. HERTWIG's experiments show that its application to an open wound is not indispensable to the manifestation of its effects, and that it may infect a healthy animal when applied to parts with a thin epidermis, even without abrasion. He further states that it is inert when applied to the uninjured villous surface of the stomach; but, in opposition to MAGENDIE (§ 40.), he considers that his experiments with inoculation prove the blood of the rabid animal to be contagious.—(*d.*) The *time of the development of the malady*, after the inoculation of the virus, varies with the corporeal and mental influences, dose of the poison, &c., from seven or eight days to seven or nine months, — usually from four to sixteen weeks. But there are cases on record, which are well authenticated, of years having elapsed from the infliction of the injury until the development of the malady.—(*e.*) When the disease is developed, the *pathognomonic symptoms*, in man, are the severe constriction about the throat, and spasmodic action of the diaphragm, with general spasm or convulsion, upon attempts to take any fluid, and subsequently at the sight of water, or of any glittering object, or the least breath or current of air, or the slightest touch of the surface*; the tenacious and clammy state of the saliva; and the frenzied or rabid paroxysms, which become more frequent and marked with the progress of the malady. This frenzied or rabid state is not continuous, or at all resembles delirium. It is present only during the impulsive or rabid paroxysm, and ceases during the intervals; although attended, towards the close of the malady, in some cases, by certain illusions of sight, it is not accompanied by any mental delusion.† It may be denominated a momentary state of phrenzy or madness; but it is neither insanity, nor mania, nor delirium.—(*f.*) According to the observation of several writers, all the *premonitory*, and many of the *advanced, symptoms of rabies appear*, after the bite of a rabid animal, and either *suddenly or gradually disappear*.‡ It is difficult to assign this occurrence to its true cause, or to any single circumstance. The symptoms in these cases may have been developed entirely by the influence of the mind, and have suddenly subsided, or gradually worn themselves out; or the dose of the poison may not have been sufficient for the full development of the malady; or the disease may actually admit of a sudden or gradual

* Dr. ELLIOTSON, whose description is remarkably accurate, justly states that the effect produced by these causes very much resembles that produced upon stepping into a cold bath. A sudden and involuntary inspiration is made, followed by several shorter ones; "and, in cases of hydrophobia, the muscles of the throat are, at the same time, violently contracted, so that the glottis violently closes, and the attempts of the diaphragm to descend, and of the muscles of the chest to elevate the ribs, are frustrated from moment to moment. The closure of the glottis is, however, not continuous, but alternates with relaxation of the muscles, so that a succession of sobs takes place."

† CHELIUS says that there is often an uncontrollable disposition to bite. Mr. SOUTH doubts the truth of this, as regards the human subject. I have, however, seen it in two instances; and it is also mentioned as being observed by POWELL and MAGENDIE. According to my own observations, the disposition in man is rather to strike, during the rabid paroxysm, and only to bite when he is restrained forcibly at that period. The remark of Mr. H. CLINE, that animals afflicted with this disease are invariably disposed to use their organs of defence, — the dog and wolf to bite; the horse to kick and bite, &c., appears quite just. In the cases in which I have observed the rabid paroxysm attended by an impulse to violence, the impulse was momentary, uncontrollable by the patient, and was always regretted and apologised for during the intervals. In all the male cases I have seen, there were almost constant erections, and furious disposition for sexual connection, especially during the rabid paroxysm — a symptom evidently connected with the seat and nature of the lesion of the cerebro-spinal axis produced in the progress of the malady.

‡ Dr. ELLIOTSON thinks it possible, that the symptoms may proceed no further than the precursory, and that the disease may go off; and he instances the cases of two girls, who were bitten in the face by the same dog. "She who was bitten the second became hydrophobic, and died. The other, at exactly the same time, experienced the same premonitory symptoms as her sister, but they all went off." Dr. MEAD remarks, that it will not seem strange "that a poison so different in its force and so alterable by many circumstances, should in some subjects produce symptoms of the same convulsive kind, yet not to such a degree as to hinder deglutition, and these, too, only at particular times. A soldier, of a strong habit of body, came to me, who once a month was seized with a great anxiety, palpitation of the heart, and difficulty of breathing. He had been bitten by a mad dog about six weeks before he began to complain. By bleeding, cold bathing, the powder of lichen with pepper, and volatile medicines, during the oppression, the fits were every month less violent, and at last quite left him" (p. 151.).

arrest under the influence of vital resistance or of medicinal agents. But the occurrences in question are remarkably rare.—(*g.*) The *duration of the disease*, when distinctly formed, generally varies from somewhat less than seventy-four hours to six or seven days. The duration has not been observed to depend upon age, nor even upon strength of constitution. The greater number of cases, however, terminate on the second, third, and fourth days, and sink either very suddenly, or rapidly, and often unexpectedly.—(*h.*) In the *dog and other lower animals* the dread of water is not observed, nor is it a sign of rabies. As the dog, in the early stage of the disease, has a disposition to lick the hands, face, &c. of persons, this should never be allowed, as I have seen, in several instances, the greatest anxiety and misery experienced for many months by persons who have permitted this filthy and dangerous habit, owing to the circumstance of rabies having appeared in the animal thus indulged.* —(*i.*) The *poison of rabies affects primarily and especially the nerves of the part*, and extends with various grades of rapidity to the medulla oblongata and origins of the pneumogastric nerves, and then the characteristic symptoms of rabies appear; the whole nervous system ultimately becoming more or less implicated, and the secretions and blood very manifestly changed.—(*k.*) The pathognomonic symptoms and changes observed in rabies more immediately depend upon the lesion of the *medulla oblongata and pneumogastric nerves;* but how such lesion gives rise to the formation of a specific poison, capable of perpetuating itself, does not appear, nor can the mode of production of this poison be shown: in this respect, rabies does not differ from other specifically infectious maladies.—(*l.*) The supposition, lately published, that there is no such specific disease as rabies, and that it is merely the result of mental anxiety, &c. is only one of the absurdities thrown up on the surface of medical doctrine, and hardly deserves mention, and much less serious refutation.

47. IX. TREATMENT.—The treatment of the bite of a rabid animal is *first* to prevent the imbibition or morbid impression of the rabid virus, assuming that inoculation of it has followed, and the consequent infection, or contamination, and other changes; and *secondly* to use reasonable endeavours to arrest the malady, or to ward off death, when the symptoms declare themselves. Although a small proportion of those who are bitten by rabid animals may be ultimately seized by the malady, especially when the bites have been inflicted through the clothes, precautionary measures should be taken, nevertheless, in order to prevent the distressing and, it may be said, the incurable effects contingent on these injuries.

48. i. PROPHYLACTIC TREATMENT.—The preventive measures usually had recourse to have generally been employed with the *intention* either of preventing the imbibition or contaminating impression of the poison, by removing or destroying the injured parts, or of fortifying the system against, or of counteracting, the influence of the poison. The former of these intentions are most to be relied upon, for we have no proof of any substance being possessed of the power of counteracting the poison when it has infected the frame, although numerous substances have been supposed to possess this property, owing to the non-appearance of the malady after inoculation of the virus was inferred. But, in many instances, the disease has not appeared, even after manifest proofs of inoculation, and when no prophylactic measures have been resorted to. Most of the means which have been advised as efficacious in counteracting, or in en-

* Having given above (§ 17, 18.) some account of *the symptoms of rabies in the dog*, much abridged from the description of Mr. YOUATT, I here add that furnished by HERTWIG and CHELIUS.—(*a.*) In the *furious form of madness*, the dog evinces a change from its usual manner, uneasiness, and disposition to change its bed or place of residence, with a desire of licking cold substances. There is loss of appetite, especially for firm food; and disposition to devour straw, wool, leather, sticks, &c. It licks up not only its own, but also other dogs' urine; and sometimes it eats its own dung. It is obstinately costive, evinces a disposition to bite, especially when excited or threatened, and snaps in the air, as if it would catch flies. There is more particularly a peculiar change in the voice and bark; the voice is hoarse, peevish, and uneasy-sounding; the bark is always followed by a peculiar howl. About the second or third day the eyes become reddened; the skin on the forehead is drawn into wrinkles, giving the animal a fretful appearance; and afterwards the eyes become dull and languid. Mr. YOUATT remarks, that the glands concerned in the secretion of saliva become increased in bulk and vascularity. There is at first an increased secretion of saliva; but it soon lessens in quantity, becomes thicker, viscid, adhesive, and glutinous; and it adheres to the corners of the mouth, fauces, and teeth. The dog furiously attempts to detach the saliva with its paws; and if, after a while, it loses its balance in these attempts and tumbles over there can no longer be any mistake. This is an early symptom; and is owing to the saliva becoming more and more glutinous, irritating the fauces, and threatening suffocation. Mr. YOUATT insists upon the alteration of the sounds uttered by the dog. In every case in which this animal utters any sound during the disease, there is a manifest change of voice which is characteristic. It is generally standing, or occasionally sitting, when the singular sound is uttered. Its muzzle is always elevated. The sound is, at the commencement, a perfect bark, ending abruptly in a singular howl. In some cases this dismal bark and howl is absent, but there is instead a hoarse inward bark, with a characteristic elevation of tone; or there are two or three distinct barks, followed by the peculiar one followed by the howl.

(*b.*) In *dumb madness*, the dog changes its manner, becomes less lively and watchful, more quiet and melancholy. The lower jaw drops as if paralysed. The saliva flows down to the ground; and every thing, even fluid, which the animal wishes to swallow, drops from its mouth. It can, therefore, bite but little, as the inclination to bite, to run, or even to restlessness, is diminished. All the other symptoms resemble those of furious madness. In the great majority of both furious and dumb madness, there is an evident affection of the lumbar portion of the spinal cord. There is a staggering gait, referable to the hind quarters, and indicating an affection of the lumbar motor nerves. In a few cases it approaches a general paralytic affection. Mr. YOUATT observes, that absence of pain in the bitten part is an almost invariable accompaniment of rabies. The dog will gnaw the flesh completely away from the part. Is this owing to the itching of the part? "However severely a mad dog is beaten, a cry is never forced from it."

(*c.*) *Diagnosis.*—Care should be taken to distinguish pain in the ear in common canker from rabies in the dog. The ear is, oftener than any other part, bitten by the rabid dog; and when the wound in the ear becomes painful, the dog rubs its ear against every projecting body, scratches it, and tumbles over and over while thus employed. Canker, both internal and external, is a disease of slow growth. The length of time that the animal has thus suffered, will usually be a sufficient guide. The dog will often scratch violently enough when it has canker; but will not roll over and over like a football, except it is rabid. The presence of inflammation and ulceration of the internal membrane of the ear in the former, and hardly at all in the latter, notwithstanding the scratching, are deserving of remark. Mr. YOUATT states that he has never seen a case of rabies in the dog in less than fourteen days after the bite. The average time he considers to be five or six weeks. In three months he considers the animal tolerably safe. He, however, met with one case after five months, and another after seven months.

abling the system to resist successfully, the operation of the poison, have likewise been employed in various states of combination, or in different modes, when the effects of the poison begin to appear; but however successful they may have proved as prophylactics — doubtful at the best — they have very rarely or never been efficacious when the malady has declared itself. In noticing *the preventive measures* which have been recommended, I shall take them *in that order which the period at which they may be resorted to will suggest;* those means which may be employed the latest, or in the advanced progress of incubation, being often appropriate, in various associations, when the precursory symptoms appear, if they have not been prescribed previously, and their inefficiency been thereby proved.

49. (*a.*) *Ligatures or cupping-glasses* may be instantly employed, when a recourse to either is possible, until other measures may be adopted, especially excision, escharotics, &c. *Ligatures* have been advised by PERCIVAL and others, and they ought to be instantly applied, immediately above the seat of injury when this can be done. Where they cannot be applied, *cupping-glasses*, as recommended by CELSUS, and recently by Sir D. BARRY, may be resorted to, the glass being placed so as equally to surround the bitten part. In emergencies of this nature, any glass, or even deep cup, may be thus applied, with the aid of a piece of burning paper, especially after having been dipped in any spirit. Neither ligatures, nor cupping-glasses, however, should be trusted to longer than either excision or escharotics may be employed by a competent person.

49. (*b.*) *The complete excision* of the injured part has been next advised; and even amputation of the part, as recommended by Mr. S. COOPER, may be resorted to, when a finger or limb has been severely injured or lacerated, or when complete excision of the parts is almost impossible or dangerous. Mr. YOUATT, whose experience attaches great importance to his advice, remarks respecting this operation, that it demands greater skill than is supposed; and that every portion of the wound with which the tooth could possibly come in contact must be removed. This is often exceedingly difficult owing to the situation and direction of the wound. The knife must not enter the wound, or it will be likely itself to be empoisoned, and then the mischief will be increased. Dr. MASSEY was convinced of this risk, when he advised that, "should the knife by chance enter the wound made by the dog's tooth, the operation should be recommenced with a clean knife, otherwise the sound parts will become inoculated." There is no doubt of this risk; and to this cause, as well as to the passage of blood into the bitten wound, to the contamination thereby caused, and to the communication of the contaminated blood with the excised surface, the occurrence of the malady, by no means rare, in cases of excision, is chiefly to be imputed. Aware of the risk arising out of excision unless completely accomplished without incurring it, many practitioners use the caustic after the knife. Nevertheless SAUVAGES, SABATIER, CHELIUS, SOUTH, and many others, trust chiefly to excision, and consider the objections just stated insufficient to cause the relinquishment of the practice. Mr. SOUTH remarks that, when the disease appears after excision, it is because all the infected part has not been removed. As a portion of the poison may remain, or be dried, upon the cutaneous surface immediately surrounding the bitten part, I would advise ablution of this part of the surface, with a caustic or alkaline solution, just before excision is performed; and that the recommendation of Mr. H. CLINE to thrust a probe to the deepest part of the injury, and to remove all the soft parts around the probe, without cutting into the wound, so that they may be brought out like a glove-finger on the probe, should be adopted. The subsequent free application of caustic potash, of nitric acid, or of the nitrate of silver, is also advisable, in order to destroy whatever poison may still remain, owing either to the penetration of the knife into the contaminated parts, or to the poisoned part having been not entirely removed.

50. (*e.*) CHELIUS states that, when complete excision cannot be done, the *quick cleansing of the wound and its entire vicinity* with water, salt-water, water and vinegar, &c., should not be neglected; and that, when the wound is small, it should be enlarged, and bleeding promoted by cupping-glasses or warm water. The whole he recommends to be thoroughly *cauterised* by the actual cautery, butter of antimony, caustic ammonia, or caustic potash, or with gun-powder, which is to be exploded. He adds that the slough is to be soon removed, and a free suppuration is to be kept up for months, by scattering powdered cantharides, and by irritating salves. He further advises mercury to be rubbed in around the wound until ptyalism is produced. The same treatment is prescribed by him if the wound, already closed, begins to smart and swell. CHELIUS here judiciously associates various measures which have singly found strenuous supporters.

51. (*f.*) Mr. YOUATT recommends, as an *escharotic*, the nitrate of silver, as it may be shaped into so sharp a form as to penetrate as far as the tooth of the animal can have reached, and as it forms a dry eschar. The danger which he attributes to the alkaline caustics, and to nitric acid, of suspending the virus, &c., I believe not to be justly dreaded; for these, in their caustic state, may be considered as capable of destroying the poison, and as completely, as the nitrate of silver possibly can. Of the several substances recommended as escharotics little need be said. The one is probably as efficacious as the other; that one, which, with efficiency, may be most promptly procured, being always preferable. — α. Mr. YOUATT, as just stated, prefers the *nitrate of silver*, and adduces the successful employment of it in hundreds of cases, in support of his opinion. — β. ECKER, FERRIAR, PINEL, RUBIÈRA, MARTINET, SOUTH, and others, advise the *caustic alkalies*, either the fixed or volatile. — γ. MEINHARD, AGRICOLA, MALDEN, FLAJANI, and numerous more recent writers, recommend the *hydro-chloric* or *nitric acid*, or the *sulphuric* or other concentrated acids. — δ. The application of *butter of antimony* to the part, after enlarging the wound, has found advocates in SABATIER, PINEL and LE ROUX; and a similar application of *arsenic* or of *arsenical paste*, has been prescribed by AGRICOLA, ZINCKE, ROUGEMONT, HARLES, and others. — ε. FABRICIUS HILDANUS, and GOCKEL, advise *boiling oil* to be poured into the enlarged wound, so that it may reach the bottom, and produce a large eschar, followed by free suppuration. — ζ. VALENTIN recommends

ustion of the part, even after several days, by means of the bark of the *fraxinus* burnt in the wound.—*η*. Recourse to the *actual cautery* has been long and generally had; but it cannot be considered efficacious unless early employed, and unless it reach the bottom of the wound.

52. (*g*.) After a satisfactory employment of the actual or of the potential cautery, *suppuration of the wound*, kept up for several weeks, according to some, or even for months, according to others, has found numerous supporters; very different means having been used with this intention. CELSUS, GALEN, FABRICIUS HILDANUS, SCHLEGEL, SCHMUCKER, BALDINGER, &c., attach much importance to this measure, whilst GEISELER, PLANK, O'DONNEL, and the FRANKS, believe it to be useless. The means which have been most commonly employed for this purpose are powdered *cantharides*; or the powder of the *meloë proscarabæus*, or *scarabæus majalis* (KEMME, FRITSCH, MÜLLER, HANNOVER, &c.), *savine*, the diluted *acids*, and strong brine, or a solution of *common salt* (DU HAMEL, PAULLINI, AWSITER, &c.). Dr. BENNETT states, that AXTER, of Vienna, applies a *blister* over the wound, and afterwards dresses it with powdered *lyttæ*, or some stimulating lotion, for six weeks; that he gives also a grain of powdered lyttæ and six grains of cancrorum oculi internally for six days; and that, "during a period of twenty-seven years, no patient thus treated had been brought back to the hospital under this disease." Dr. HAUSBRAND employs general *bleeding*, and makes deep *scarifications* of the wound, which he washes with *salt* and *water*, after favouring the flow of blood as much as possible. He then applies an ointment of *unguent. basilicum*, and *pulv. lyttæ*, and keeps up a discharge for three months. He also gives *camphor* and *opium* internally, during the first three days. "Eleven persons bitten by dogs actually rabid escaped after this treatment." Dr. WENDT, besides keeping up, for six weeks, *suppuration* of the wound by means of pulv. lyttæ, or other irritating applications, employs *mercury* internally so as to produce salivation. Of 180 persons thus treated in the Breslau hospital, of whom half had been bitten by dogs actually rabid, or supposed to be so, only two died. The German physicians generally confide in *prolonged suppuration of the wound*: but Mr. YOUATT, who has employed the *lunar caustic*, having previously enlarged the wound, when this is necessary, to upwards of 400 persons, and four times on himself after bites from dogs decidedly rabid, has not seen the disease appear in one instance.

53. *A*. The foregoing measures are those which have been most confided in when adopted immediately or soon after the infliction of the injury. But they have likewise been resorted to during the *latent period*, or at a time more or less remote from the receipt of injury; and various additional means have also been prescribed as prophylactics during this period. Dr. A. T. THOMSON supposes that the virus remains latent in the wound during this period, and produces no marked effect until the state of the constitution favours its action; and hence he infers that *excision* and other *local measures* may be useful at any time before the precursory symptoms appear. Several facts have been adduced tending to show that this opinion is deserving of attention. RUSH has related a case in which "excision was performed thirty-one days after the bite, and even after the hydrophobic symptoms had appeared, and the patient's life was saved." Dr. HARDER relates a case (*Petersburg Med. Trans.* vol. i. p. 170.), in which hydrophobia supervened five months after the bite, and eight weeks after excision; but another excision and cauterisation then saved the child. In two weeks the symptoms returned, and a pale and painful excrescence formed in the bottom of the wound. This was excised, and the wound cauterised by nitrate of silver, and recovery took place. Dr. BENNETT states that M. RECAMIER opened the cicatrices which were tumefied in a person who had been bitten by a rabid animal fifteen days before, and cauterised them with the crystallised *nitrate of mercury*. Baths and diaphoretics were also employed, and the patient escaped the malady; although another person who had been bitten by the same animal, at the same time, perished of rabies. These cases fully warrant excision and the cautery at any period, even up to the time of the manifestation of the disease, and especially when pain, swelling, itching, or discoloration of the cicatrix appears. At this period more particularly, Dr. SCHÆFFER recommends the nerves going to the part to be divided.

54. (*a*.) Dr. MAROCHETTI, who considers that small pustules form under the tongue during the latent or incubative period (§ 7. *Note*.), contends that the true preventive measures consist of *opening and cauterising these pustules*, within twenty-four hours after their formation, of washing the mouth with a decoction of the *genista tinctoria*, and of the patient's drinking a pint and a half of this decoction, daily, for six weeks. SALVATORI and ROSSI have been said to have succeeded in some cases, in which these means were adopted; but M. MAGISTEL states that, of ten cases in which he employed them, five died; although more might have been affected if nothing had been done.

55. (*b*.) During the latent period numerous other means have been advised, in order to counteract the operation of the poison, or to enable the constitution to resist its influence. Many of these means have been recommended with more or less rational intentions, whilst others have been employed empirically. Of those, which have been advised with the former of these intentions, some have been suggested with the view of exciting certain emunctories, and thereby preventing changes affecting the constitution of the blood from taking place; and others have been prescribed with a view of supporting the vital powers, and thereby resisting the action of the virus, and of accomplishing other contingent intentions. Some of these means are both local and constitutional, and others are employed either externally or internally only.

56. (*c*.) *Powdered cantharides*, both locally and internally, have been recommended by WERLHOFF, ALIX, WICHMANN, VOGEL, CATANI, SCARAMUCCI, and ROUGEMONT, for some time after the bite, and even when signs of irritation appear in the cicatrix; and STAHL and others advise that the use of this substance should be persisted in until the urinary organs are affected, or until bloody urine is produced,—a recommendation to which AVICENNA attached importance in respect of the employment of other active diuretics in this malady. The *meloë proscarabæus* was similarly

prescribed by SENNERT, SCHRŒDER, REIDLIN, and others, both immediately after the injury, and during the latent period.

57. (*d.*) *Chlorine, chloric,* and *hydrochloric acid,* have been much used both locally and internally, to dis-infect the wound and to resist the influence of the virus on the frame. MALDEN, AGRICOLA, MEINHARD, and SEMMOLA, have attached much importance to these substances; but several instances have been recorded of the appearance of the malady notwithstanding a prolonged recourse to them. *Arsenical preparations* have likewise been employed in the latent period, both locally and internally, and continued for a considerable time, or according to the quantity prescribed and its effects. HARLES, and others already mentioned, appear to have attached some importance to their use. An infusion of *rue* in *acetic acid,* or the *acetum rutæ,* has been employed both locally and internally by WEDEL and others, and continued for several weeks after the injury; the *theriaca* being also taken for a considerable time.

58. (*e.*) There are few preparations whose local or external and internal use have been more frequently recommended than the *mercurial.* The *bi-chloride,* the *chloride,* and the *ointments,* have been severally employed both locally or externally, and internally, in the course of the latent period; and even when the precursory symptoms have appeared — and not only singly, but also in various quantities and combinations. The application of the *sublimate* to the wound was first prescribed by FABRICIUS HILDANUS and PALMARIUS; and, more recently, WEDEKIND, PERCY, and numerous writers in the Memoirs of the Royal Academy of Medicine of Paris for the years 1777, 1778, 1782, and 1783, advised its use, both locally and internally, as a prophylactic. *Calomel* was employed with *sulphuret of antimony, camphor,* and various other substances by RANBY, WESTALL, and others, and given in large and frequent doses until the mercurial action appeared. The strong *mercurial ointment* was applied to the wound also externally by *friction,* conjoined with camphor, by BAUDOT, DESAULT, HANNOVER, POSTAL, and others, and whilst this application was made to the wound PERCIVAL recommended *cinchona* and *wine* to be taken, in order to promote the nervous energy and the vital resistance of the constitution to the poison. Mercurial frictions, the ointment being mixed with camphor and musk, were directed over the parotid glands by SCHRŒDER and SAULGIER; and continued until salivation followed. Whether used internally or externally, or in any of the combinations just mentioned, or in any other, HOLDEFREUND, COLOMBIER, FALCONER, and many others, advised the preparations of mercury to be persisted in until salivation was produced, and to be continued for a considerable time.

59. (*f.*) *Frictions with olive oil,* whilst this oil is taken internally so as to preserve a regular state of the secretions and excretions, were recommended by SHADWELL, SIMS, and FOTHERGILL, and to be continued for a long time after the injury. BAUDOT and others advised that the frictions should be made with a combination of the oil with mercurial ointment and camphor; and MEASE and LOFTIE with olive oil and the *oleum succini.* WATT recommended a seton to be introduced into the nape of the neck, and the discharge from it to be freely promoted — a suggestion by no means undeserving of adoption, considering the very remarkable changes generally found in the medulla oblongata and its membranes after death, and which the seton may prevent by the revulsive irritation produced by it.

60. (*f.*) *Baths, cold, warm, and medicated,* salt-water baths, the cold affusion, &c., have severally been mentioned by writers, from CELSUS downwards; but they are of doubtful service. Cold salt water bathing, and shower baths seem most appropriate, as tending to diminish susceptibility and to invigorate the frame; but I am unacquainted with any satisfactory proofs of their efficacy.

61. (*g.*) Numerous *stimulants, antispasmodics,* and *tonics* have been advised, with the intention of enabling the nervous system to resist the operation of the rabid virus. *Musk,* in various combinations, and more especially with opium, has been employed by several writers; and *opium* in numerous forms of association have been prescribed by many authors. *Myrrh,* with opium, &c., was recommended by SCHLEGEL; *serpentaria* with the wine of *absinthium,* by VALENTINI; the infusion or decoction of the leaves of the *taxus baccata,* internally and externally, by ROUGEMONT, RŒMER, and HILDEBRAND; the decoction of *rue* with that of the taxus baccata by BLAINE; the powder, or infusion, or the oil of *valerian,* by BOUTEILLE and others; *ammonia* and its various preparations, in large doses, and in various combinations, as with the *anagallis purpurea,* the *oleum* or *spiritus succini,* &c. by ANDRY, RAVENSTEIN, and others; *assafœtida* with camphor, musk, and opium by SCHMUCKER, ALIX, and NUGENT; the powder or extract of *nux vomica* by SCHULZE and ROUGEMONT; *phosphorus* in æther by ZINCKE; and *cinchona, wine, aromatics,* and various tonics, by MEASE, LOFTIE, and numerous other writers. The *anagallis flore purpurèo* was praised by KEMPF, ANDRY, and RAVENSTEIN, was given in doses of a scruple, every sixth hour, and was prescribed with ammonia by some, and both externally and internally by others; but RAYMOND and other writers state that it is inefficacious.

62. (*h.*) Several *anodyne, narcotic,* and *sedative* substances have also been tried — during the latent period, with the hope of thereby preventing the development of the malady; but with no evidence of even such partial success as may hereafter warrant recourse to any of them. These substances, as well as those belonging to the preceding category, were seldom prescribed alone, but were generally conjoined with other internal or external means. Thus *stramonium* was prescribed internally by HARLES, with laurel water, and *belladonna,* by HANNOVER, MUNCH, and HENNING, whilst suppuration of the wounds was promoted.

63. (*i.*) It is unnecessary to pursue further the history of means employed in order to prevent the development of the malady after inoculation of its virus is either feared or presumed. An impartial view of all the circumstances involved in cases of injury by rabid animals, discloses various fallacies which weaken the evidence of success which has been imputed to many substances which have been employed as prophylactics; and, whilst some have been insufficiently tried, and their in-

efficacy hence not demonstrated, others have been found to fail, upon the success of which much reliance had been previously placed. But it may be asked, should these latter be discarded altogether, or should the facts stated in their favour be discredited because they have been found to fail in one, two, or even in a few instances? The answer I would suggest is, that they ought not to be discarded unless in favour of means which promise a more certain success; for if they be relinquished for these reasons, then with equal reason should all diseases be left to the unaided efforts of nature, inasmuch as no unvarying plan of cure, or no single remedy is efficacious in all cases of any specific malady; and, as regards the prevention of rabies, means which often have proved efficacious in respect of some states of constitution, or against certain grades of infection may nevertheless fail in other circumstances, either of constitution or of inoculation.

64. ii. CURATIVE TREATMENT? — However doubtful, or even hopeless, the success to be derived from treatment when the malady has declared itself, nevertheless the attempt to cure the patient should be rationally made. Instances of recovery from the developed disease are so few as to induce many to believe that they were not really cases of this disease, but of some other affection, in which dread of water was a prominent symptom. Nevertheless, in a few cases of recovery — certainly very few — the evidence as to the actual existence of true rabies admits not of doubt.—(a.) In most, if not in all of these, *blood-letting*, carried to the utmost extent, was the remedy to which recovery was chiefly imputed — a treatment advised by BOERHAAVE, MEAD, FOTHERGILL, FERRIAR, MEASE, NUGENT, HARTLEY, RUSH, WOLLASTON, and others. I have referred to the published cases by HARTLEY, PETERS, INNES, TYMON, BURTON, SHOOLBRED, WYNNE, VOGELSANG, and DU HEAUME, in which very copious blood-letting was employed with success. This treatment has certainly been resorted to by many physicians without success; but I believe that in many instances it has not been carried sufficiently far, or has not been resorted to at an early enough stage of the declared malady. I think that these causes of failure are manifest in the cases detailed by Dr. ALBERS of Bremen, TROLLIET, and by others; and that the opinion expressed by Mr. S. COOPER, and by Dr. J. L. BARDSLEY, as to the successful cases not having been instances of true rabies, is not correct, as an attentive perusal of the details of these cases convinces me that they were actually what they professed to be. BERGER, one of the earliest writers who recommended blood-letting, advised that the blood should be taken from the frontal veins; and WEDEL that it ought to be drawn from the sublingual veins. In the vicinity of BRESLAU in 1719, a cow, the subject of rabies, was cured by an enormous venesection. The case of recovery recorded by Dr. BURTON was treated by the abstraction of 122 ounces of blood within four days, and by calomel and opium. In the much earlier instance recorded by Mr. HARTLEY about 120 ounces were taken, and the cold bath frequently resorted to; a similar treatment, with the addition of opiates and sudorifics, having been resorted to successfully by HILLARY. In Mr. TYMON's case, very copious blood-letting was accompanied with large and frequent doses of opium, with calomel, James's powder, and mercurial inunction. Dr. SHOOLBRED, finding immediate relief to follow a very large venesection, trusted to this agent chiefly. In Dr. DU HEAUME's case profuse blood-letting allayed the fully developed symptoms, and draughts with digitalis, hydrocyanic acid and morphia were given, and a drachm of the strong mercurial ointment was rubbed into his legs night and morning. Dr. VOGELSANG, after insisting upon blood-letting as the remedy alone to be confided in, shows that it should be resorted to as early as the malady declares itself, and that it ought to be carried at first to the greatest length consistent with the immediate safety of the patient. Dr. SHOOLBRED's recommendation is to a similar effect; but he advises that the venesection should be with a large orifice in order that full syncope should follow.

65. It does not appear that the very large doses of opium, the calomel and mercurial ointment, the cold baths, or the diaphoretics prescribed in several of the successful cases in which large blood-lettings were practised, had much to do with the recovery; inasmuch as these means had, on numerous occasions, been employed to a very great extent without any benefit. Probably, however, the mercurials, the consequent salivation, and copious diaphoresis, produced some service, or aided in preventing the recurrence of the rabid paroxysms. That blood-letting is a rational method of treating this malady is not only proved by its recorded success, but also evinced by the inflammatory or congestive changes found after death in the medulla oblongata, lungs and brain (§§ 20—23.).

66. *B.* Other *evacuants*, beside blood-letting, have been employed, but with doubtful results. — (*a.*) *Emetics* often repeated were recommended by MASSALIEN, ROUGEMONT, SATTERLY, and others; the antimonial emetics conjoined with camphor, musk, &c. being preferred, with the view of producing also free diaphoresis. How far they may be of service I am unable to state; but the occasional imperfect retchings or vomiting, and the state of the alvine evacuations, indicate the propriety of an early recourse to them, or as soon as the hydrophobic period declares itself.

67. (*b.*) *Purgatives*, after blood-letting and emetics have been resorted to, have been advised by comparatively few writers; but I agree with the few who approve of their exhibition that the cholagogue purgatives are required, more especially calomel, or the corrosive sublimate, or the turbith mineral, aided by purgative enemata. Most of the writers who have advised these latter preparations have entertained the intention of producing *salivation* by them as well as a free evacuation of bile; and have therefore aided this latter operation by the inunction of strong mercurial ointment; and by conjoining them with antimonials, or with camphor, or various other remedies according to the progress which the disease had made. These medicines have been much employed as prophylactics (§ 58.); and when thus resorted to, it is difficult to form a correct estimate of the amount of benefit derived from them; but when the hydrophobic stage has supervened, there is very slight evidence of decided advantage having been derived from them, although, in one or two instances on record, success even in this stage has been imputed to them.

68. (*c.*) *Profuse diaphoresis* has been said to

have proved successful when early procured and perseveringly promoted. It is most difficult, however, to produce the effect in a sufficient degree by internal medicines, unless they are promoted by the vapour-bath, or by heated air. This practice has nevertheless been sanctioned by GOCKEL, VATER, WALDSCHMIDT, PAULLINI, HILLARY, RICHTER, and others; but I doubt that it has been employed in so decided a manner as to test sufficiently its effects upon the malady.

69. *C.* The *sedatives*, *narcotics*, and *anodynes*, usually prescribed in medical practice, often have been employed as soon as the hydrophobic symptoms have appeared, but scarcely even with a palliative influence. — (*a.*) Of the several *sedatives* which have been suggested, the *cold affusion*, *prolonged shower-baths*, or *submersion* and *cold baths*, are the most energetic. They have been recommended by RANBY, HARRIS, RUSSEL, WARD, and others, but upon no evidence of their efficacy; whilst FOTHERGILL, DICKSON, WALDSCHMIDT, and many other writers, have considered them worse than useless. The same contradictory opinions have been emitted in respect of *warm*, and variously *medicated*, and *alkaline baths*, which have been advised from theoretical views rather than from any experience of their influence on this malady. In most of the instances, however, in which I find any record of the manner of employing these baths, they appear not to have received a satisfactory trial, and not to have been persisted in, or repeated, so as to produce a copious and prolonged sweat, or to an extent equal to that suggested above (§ 68.). Of other sedatives *digitalis*, *hydrocyanic acid*, and the *diacetate of lead*, are the most deserving of notice. *Digitalis* was suggested by Dr. PERCIVAL, and several instances in which it has been given without any marked effect have been recorded. No advantage can be reasonably expected from it unless it be prescribed promptly, and in nearly poisonous doses. *Hydrocyanic acid* was given by Dr. A. T. THOMSON, but with little or no benefit. The remark just offered respecting digitalis is even more applicable to this acid when prescribed for rabies; and if it should ever again be given in the developed malady, I would advise it to be tried in the largest dose compatible with the continuance of life; and to be followed, during its sedative action, by the affusion of cold water over the head and occiput. I may add, that *laurel-water* was recommended with belladonna by HECKER and SCHWABISCHER in the developed state of the disease, but it does not appear that the recommendation proceeded from any sufficient experience of advantage from them. The *acetate of lead*, advised by HEUZWISCH, and the *infusion of tobacco*, as an injection, prescribed by Mr. SAWREY, belong to this category, and hitherto no evidence has been produced in their favour.

70. (*b.*) Of *anodynes* and *narcotics*, *opium* and its various preparations and salts—the *acetate* and *muriate* of *morphia* — have been most employed; but, although severally prescribed in remarkably large and frequently repeated doses—although as much as 200 grains of opium have been given within twelve hours, no benefit was derived. Mr. WARD advised opiate frictions, and Dr. BOOTH the injection of a solution of the acetate of morphia into the cephalic vein. This latter measure was practised by Drs. BRANDRETH and BARDSLEY without any advantage. The preparations of opium and of morphia have been given in all combinations and forms — with camphor, with musk, with myrrh, with ammonia, with valerian, &c. — by the mouth and in enemata, but with no benefit when confided in as the chief means of cure, and only with equivocal advantage when prescribed after large bleedings. — *Belladonna* has been recommended not only as a prophylactic, but also as a cure, by MUNCH, HENNING, HANNOVER, and others already mentioned, aided by division of the nerves going to the cicatrix, or by re-opening the cicatrix and procuring a copious discharge from it; and by combining the belladonna with the substances just enumerated. But there is no evidence of success having followed a recourse to this medicine. The same remark is equally applicable to *stramonium*, which was suggested by HARLES to be given in laurel water; and *conium* is equally inefficient. More recently the tincture, infusion, or extract of the Indian hemp — *canabis Indica* — has been recommended, but I have not heard of any instance of success from the use of this intoxicating substance. Indeed, when the changes found after death are considered, no advantage can be rationally expected from any one of the anodynes or narcotics, when trusted in chiefly, or given in excessively large doses. It is extremely probable, that *æther*, *chloroform*, and other substances productive of insensibility when administered by inhalation, will receive an early trial in this malady; but, for the reason just assigned, no sanguine hopes of success from them can be entertained. Nevertheless, "Anceps remedium melius est quam nullum;" and the remedies of this class may be productive of some benefit, either when inhaled or taken internally, or when administered externally or locally. The local application also of these anodynes may be of use, both in the premonitory stage, and in the advanced course of the malady.

71. *D.* The most powerful *antispasmodics* and *stimulants* have been advised, and often employed, but with no proof of advantage having been derived from any of them. — (*a.*) The *æthers*, *musk*, *camphor*, *ammonia*, *castor*, *assafœtida*, *turpentine*, *valerian*, &c. have severally received satisfactory trials, and their want of efficacy in this malady has been sufficiently demonstrated, both when given alone or in conjunction with other medicines, in which latter form they have been most commonly prescribed, more especially with *opium*, or with *belladonna*, or other narcotics, as mentioned by MEASE, BUCHOLZ, NUGENT, and many others. And these medicines have not only been administered by the mouth, but also in enemata, and in various combinations. *Æther* was thus given with opium by MEASE; with *phosphorus* by ZINCKE; with the succinated spirit of ammonia, with camphor, &c. by several other physicians. *Musk* has been exhibited in similar modes and combinations—with opium, belladonna, camphor, &c.; and with cinnabar, creta, and opium, forming the pulvis Cobbii or Tunguinensis; but there is no sufficient evidence of its efficacy. In a case which I attended with Mr. DENDY, the spirit of *turpentine* received for the first time a sufficient trial — a trial demonstrative of its want of efficacy in this malady. — (*b.*) *Electricity* and *galvanism* were recommended by ROSSI and ALDINI, but no permanent benefit was derived from them. — The *nitrous oxide gas* was administered by Dr. BARDSLEY with little effect.

72. *E. Tonics* of various kinds have also been tried, but with no marked benefit. *Nux vomica* was given by ROUGEMONT and SCHULZE, and *strychnia* by Dr. BARDSLEY. The *mineral acids*, more especially the *hydrochloric*, have been recommended by MEINHARD, AGRICOLA, MALDEN, ANCELLI, BRUGNATELLI, and others; and, probably after bleeding, the *chlorate of potash*, and the *chloric æther*, are deserving a trial. The *mineral salts*, especially the nitrate of *silver*, the preparations of *zinc*, the muriated tincture and other preparations of *iron*, have likewise been prescribed; the last by Dr. ELLIOTSON, BRIGHT, and others. The several *vegetable tonics*, especially the *cinchona* and *cascarilla* barks, *sulphate of quina*, &c., have also been suggested, variously combined, and aided by other means, as wine, aromatics, antispasmodics, &c.; but, although MEASE, LOFTIE, and others, have conceived that advantage might be derived from this class of medicines, especially when thus associated, or combined with anodynes or narcotics, no satisfactory evidence that benefit has been derived from them, when the disease is developed, has hitherto been furnished. Dr. SEMMOLA has insisted upon the employment of chlorine, both internally and externally, as a prophylactic, and as a means of cure.

73. *F. Diuretics* were recommended for rabies by AVICENNA; but STAHL considered that no advantage could be derived from them unless they are given in so large doses and so frequently as to produce bloody urine; and with this view cantharides and the meloë proscarabæus have been prescribed by numerous writers, even since the empirical reputation of the latter in rabies has been shown to be, like all other nostrums, without any foundation.

74. *G. Tracheotomy* was advised to be performed by Drs. RUSH and PHYSIC in America, and recently by Mr. MAYO, with the view of averting death as long as possible; believing that this issue was more immediately produced by spasm of the laryngeal muscles; but it is doubtful whether or no spasm of these muscles is more concerned in producing this result than spasm, or even than paralysis, of other muscles or parts.

75. *H.* M. MAGENDIE, believing that the fluid parts of the blood were diminished by the inability of the patient to swallow fluids, and by the continued transpiration from the surfaces, injected a pint of water, of the temperature of 30° of REAUMUR, into the veins of a man in an advanced stage of rabies. The patient immediately became tranquil, and his pulse, in twenty minutes, fell from about 150 to 80. The spasms ceased, and he drank a glass of water. He continued to improve until the fifth day, when abscesses, primary and secondary, appeared in consequence of portions of lancets, which had broken during attempts to bleed him in the feet during the paroxysm, having remained in the wounds. He died early on the ninth day.—(*Journ. de Pysiol.*, t. iii. p. 386.)

76. In a malady so little under the control of medical treatment as this confessedly is, reliance cannot reasonably be placed on any single remedy; and hence, various means have been often employed, coëtaneously or successively, to arrest its progress, or to combat its more distressing symptoms. Numerous *combinations of the medicines* noticed above, either as prophylactics or as curative agents, have been advised by writers — but advised rather as suitable means for trial, than recommended from satisfactory, or even from any, experience of their efficacy.

77. (*a.*) B. D. MAUCHART long ago directed blood-letting from the arm of the side in which the injury was inflicted, and a quantity of blood to be taken great in proportion to the time which had elapsed from the infliction of it. If the patient had become melancholic, or if any of the symptoms of the invasion of the malady existed, he ordered the blood-letting to be carried to the production of full syncope. He next ordered the cicatrix to be scarified and the bleeding from it to be encouraged; afterwards the mithridate, rue, theriaca, &c., to be constantly applied to it; and these and similar substances to be taken internally. He further directed a copious diaphoresis to be kept up, and prescribed the same or similar means both to prevent the malady, and to cure it when it appeared; success having been said to follow this plan even where the disease was fully developed. It would be impossible for me to notice, within reasonable limits, other associated means which have been suggested by authors. The reader will find most of them in the numerous works and papers referred to in the sequel; and he will further observe that substances confidently recommended, either empirically, or by professional credit, as most efficacious remedies in this malady, have after a time altogether lost their reputation, not merely from having been displaced from public or medical favour by newer means, but because they have been found totally inefficacious when employed.

78. (*b.*) The uncertain or fluctuating views as to the pathology of rabies, have tended not only to render equally uncertain the plans and means of treatment, but also to increase the number of substances advised as specifics with the utmost confidence which ignorance imparts to empirical means. As certain contagious maladies have been cured by medicines, viewed as specific means, or such as may be depended upon for the removal of these maladies, so has it been expected that rabies was to be cured by some particular remedy which, if once found out, might be proclaimed as the true panacea. Hence various substances have been, from time to time, thus dignified, and enjoyed a short-lived popularity. At a time when credulity was not limited to a few individuals, but extended to scientific and corporate bodies, or rather when individuals were so generally credulous as to impart this character to the societies which they constituted, certain substances received a reputation from this weakness of the human mind; and at a time when it was most implicitly believed by all physicians from Oxford and Cambridge, but by themselves only, that all learning and knowledge were concentrated in themselves alone, the ash-coloured liverwort was dignified by these physicians with the name of the *Pulvis antilyssus*. Subsequently other empirical remedies have thrown the college nostrum in the shade, and the virus inoculated by the *bite of a viper*, the *guaco-juice*, the *Scutellaria laterifolia*, the *Alysma Plantago*, the *Ophiorhiza mungos*, the *Genista tinctoria*, the *Thalictrum flavum* and *angustifolium*, the *Delphinium consolida*, the *Anagallis purpurea*, *phosphorated æther* or *phosphorated water*, and numerous other substances, have in different countries, and at successive periods, enjoyed their undeserved and short-lived reputations, and sunk into congenial

oblivion. It may be added, for the information of those who take delight in empirical remedies, that in almost every town, in every country, may be found some old man or old woman, who rejoices himself or herself, or knowingly deceives the neighbours and all the credulous within reach, in all ranks, with the professed possession of a specific against rabies; and that these specifics, according to the amount of patronage conferred upon them, have at different times enjoyed a reputation, which was overturned only after numerous proofs of their want of efficacy. The Ormskirk powder, and the pulvis Tunguinensis are sufficient illustrations of the popular faith in vaunted but worthless specifics, and the credulous confidence they inspired. Numerous recent deceptions, absurdities, and fooleries — deceptions on so large a scale as to comprise the whole range of disease — have thrown these and other absurdities into the shade, and have proved humiliating illustrations of human nature; demonstrative of the extent to which knavish pretension, with a designing sacrifice of human life to selfish acquisition, on the one hand, and credulous patronage on the other, lower the just estimate of moral and intellectual endowment, and sink the general standard of common sense and sagacity, as manifested throughout the community, from the highest places, through all ranks, classes, and grades, down to the lowest sinks of wretchedness.

79. *I. Treatment advised by the Author.* — After the review which I have now taken of the treatment which has been recommended for the cure of rabies in the earlier as well as in the more advanced stages of the developed malady, and reflecting upon what I have myself observed, I may be permitted to state the means, in which I am disposed to place reliance when the disease has declared itself: — *Bleedings* from the arm to syncope, or large *cuppings* on the nape of the neck, repeated, or carried as far as the habit of body, and circumstances of the case will permit, have a greater amount of evidence in their favour, than other remedies, and are moreover more consistent with the lesions observed after death. After bleeding, the nerves proceeding to the cicatrix may be divided, and the cicatrix itself laid freely open, suppuration from it being as speedily and freely produced as possible. Immediately upon opening the cicatrix, &c. a free perspiration should be procured and kept up by a hot-air bath, for which the materials are always at hand — namely, blankets and a lamp, — or by a vapour bath. In other respects the treatment must depend much on circumstances, and on the predominance or urgency of particular symptoms, for which emetics, mercurials, purgatives, enemata, anodynes, narcotics, antispasmodics, stimulants, tonics, &c. may be employed according to the procession and severity of the morbid phenomena.

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of the malady by linen, rags, cloths, &c., which had been torn by, or imbued with the saliva of, rabid animals, and even by the cords with which these animals had been tied. The skins, fleeces, and furs of animals which had retained the saliva or foam that had issued from the mouth at an advanced stage, have even been the media of transmitting the malady, by having brought the virus in contact with an abraded or mucous surface of the infected person. Such occurrences, however, must be remarkably rare; but they are so possible as to render caution necessary, whenever an animal is in any way dealt with in this disease, or even when the existence of the malady is suspected. The statement which has been made, that the breath of a rabid animal, at an advanced stage, may communicate the malady, rests upon very insufficient evidence. The experiments of MAGENDIE and others show that the blood, milk, flesh, semen, and abdominal secretions of a rabid animal cannot transmit the disease. As to the particular source of the rabid virus, I shall offer some remarks in the sequel.

41. VII. NATURE OF RABIES.—That the poison of rabies is not imbibed by the capillaries of the injured part and carried into the circulation, is shown by the long period which elapses from the inoculation until the disease is developed, and by the characters of the precursory and early symptoms. That it is not absorbed by the lymphatics is evinced by the absence of every sign of irritation of these vessels, or of their associated glands. It is therefore to the nervous system that we are compelled to look for the earliest changes consequent upon the inoculation of the virus. As to the pustules, said by MARROCHETTI and MAGISTEL (§ 7. *note*) to appear under the tongue from three to fourteen days, and even, in some cases, at a later period, from the inoculation of the virus, their existence may not materially affect the question as to the mode in which the poison affects the constitution. But it is by no means determined that these pustules actually exist; and, even admitting their existence, their pathological relations and nature are unknown. It is possible that they are merely enlarged, or obstructed mucous follicles; but, as such merely, their presence ought to be positively determined, and their connection with rabies investigated in its several relations.

42. The history, progress, and character of the phenomena of rabies are entirely those of a nervous malady of the most intense form. The gradual accession of the symptoms; the altered, and especially the acute, sensibility accompanying them; the readiness with which this sensibility, either of the surface or of the senses, induces, spasmodically and in paroxysms, the reflex actions of the muscles of voluntary motion, even independently of volition; the intermittent character of these actions; the marked disorder of the organs influenced by the eighth pair of nerves; and the inordinate susceptibility of the nervous system generally, combine to demonstrate an important change of that part of the nervous system to which sensibility may be especially referred, and which either gives origin to, or is more particularly connected with, the pneumo-gastric nerves. The changes more recently and most generally observed in the medulla oblongata, often extending to various parts of the base of the brain on the one hand, and to the spinal cord on the other, explain the characteristic symptoms now enumerated. It is only in comparatively recent times that our investigations have been directed to this portion of the nervous system in respect of this disease; and in all cases where the inquiry has been duly instituted, some lesion, indicative of extreme irritation or vascular excitement in this quarter, has been found. Vascular injection, ecchymoses, increased redness or congestion, serous effusion, softening of the cerebral or nervous structure, &c., have been severally observed after death. M. TROLLIET, one of the first observers who directed attention to this part of the nervous system in rabies, states that the choroid plexus is generally gorged with dark blood; that a small vascular plexus shuts posteriorly the fourth ventricle, and extends to the origin of the eighth pair of nerves and corresponding parts of the brain, which are found redder than usual; that this plexus is generally so deeply injected or coloured as to appear ecchymosed; and that the most remarkable lesions are found in the vicinity of the origins of the optic and pneumo-gastric nerves, which latter perform so important a part in rabies. A due recognition of the several functions of the pneumo-gastric nerves, and of their connections with the ganglial nerves both of the the thorax and abdomen, will serve to explain most of the phenomena of this malady. Dr. BENNETT justly observes, that a careful perusal of the experiments of Dr. J. REID (*Edin. Med. and Surg. Journ.* No. 134.), and of other physiologists, will show that congestion of the membranes at the base of the brain, producing more or less pressure on the origins of the eighth pair of nerves, is capable of explaining all the phenomena the disorder presents.

43. Certain of the changes observed after death may be directly referred to violent irritation or vascular excitement in the parts of the nervous system above mentioned; but others are altogether consecutive of these conditions, or are the results of the paralysed functions of the eighth pair of nerves, induced by the changes in these nerves, or in the vicinity of their origins; whilst there are also others which depend either upon the mode of death — upon asphyxia either suddenly or gradually induced, or upon cadaveric conditions, or most probably upon both. Several of these consecutive changes, existing either in the digestive canal or in the respiratory passages, have been viewed as the seats and origins of the malady; and, however slight, have had an importance assigned to them to which they are not entitled. Because the pharynx presented appearances of irritation, FOTHERGILL considered rabies as merely a spasmodic angina, and, as this irritation often extended to the larynx and trachea, PARRY viewed these as being chiefly concerned with the pharynx in the production of the malady; subordinate and secondary changes being thus assigned as the conditions constituting the disease. The alterations observed in the lungs, bronchi, and blood, are obviously to be referred to the lesions found in the medulla oblongata, base of the brain and vicinity, and to the consequent paralysis or similar disorder of the functions of the pneumo-gastric nerves; the circulation in the lungs and bronchial mucous surface, the secretion from this surface, and the chemical changes in the blood being thereby affected.

44. *What are the humours of the rabid animal which contain the virus perpetuating this malady? And what is the mode in which this virus acts in producing its fatal effects?* — These questions have a real importance as respects the prevention and prophylactic treatment of rabies; but they are beset with difficulties. — (*a.*) As to the *first* of these, the evidence is rather negative than positive. M. TROLLIET, MAGENDIE, and others have shown, by direct experiment and observation, that neither the blood, nor the flesh, nor the milk, nor the seminal fluid, nor the breath of the enraged animal, is capable of propagating the malady. A similar inference may be arrived at in respect of the secretions and excretions from the abdominal viscera. It is, therefore, to the secretions of the mouth, or to those issuing from this outlet, that we must exclusively look, as the vehicles of, or as the actual poison. The saliva has been viewed from the earliest period of medical history as constituting, or as conveying, this poison; and the mode of communicating the malady has been of itself a strong proof that it is actually the poison. More recently M. TROLLIET has contended, that the saliva possesses no contagious properties, unless it becomes mixed with the frothy matter which is driven out from the bronchi, this latter matter constituting the poison or virus which produces the disease. He rests his opinion upon the absence of any evidence of disease, of enlargement, of inflammation, or of congestion, of the salivary glands, upon the morbid changes always existing in the bronchi of the rabid animal, and upon the analogies furnished by other contagious maladies.* — Although I consider M. TROLLIET's opinion to be deserving due consideration in all our future investigations, still it cannot be altogether admitted that he has proved the saliva, unmixed with other fluids, to be devoid of the poisonous property, or that he has demonstrated this property to be present in the secretions of the bronchial mucous membrane. Nevertheless, his investigations and his views are deserving attention, far beyond what they have hitherto received in this country.

45. (*b.*) *As to the mode in which the rabid virus acts in producing its effects*, we know nothing more than of the operation of other animal poisons, and perhaps even less. The oldest opinion, as to the action of the virus, after being received into a wound, was that it is absorbed and mixed with the circulating fluids, and that it thus produces a general infection of the humours and solids of the body. A subsequent theory ascribed its action to the effects produced in the place injured, and the propagation of this lesion through the whole nervous system. That the fluids and secretions are, generally, infected by this poison is disproven by experiments and observation; and the local effects of the injury bear no proportion to the subsequent constitutional disorder, so as to furnish an argument in favour of the opinion, that the disease arises from the propagation of the local impression throughout the rest of the system. It has already been stated, that the virus does not act by absorption, because the lymphatics and glands betray no signs of irritation, and because the bloodvessels also present no lesion. It has been supposed, that the change locally produced is propagated to the nervous system generally: but granting that this is the case, we are still at a loss to explain the production of a contagious principle, and the limitation of the production of it to a particular part and to a particular secretion. We may, however, readily conceive, that the virus affects or irritates the nerves in the part injured, and that this local change in the nerves is propagated, by means of the sensory nerves, to the medulla oblongata, or to parts in its vicinity, to which they are more especially related; that the morbid condition or change thus produced, is reflected by means of the nerves arising in these parts of the cerebro-spinal axis, to the respiratory and gastric organs, and more especially by the pneumogastric nerves; and that, in consequence of the change in the influence transmitted by these nerves, the circulation, secretions, and functions generally of these organs are altered. — As to the source of the contagious virus, the evidence is inconclusive, although it cannot be doubted, that the secretions which are excreted from the mouth actually contain this poison, and that the formation of it takes place at that period of the disease when the functions of those organs, supplied by the pneumogastric nerves, present more or less disturbance. That the succession of changes just stated is followed by the formation of a specific poison — of a secretion capable of perpetuating the malady — is extremely probable; but the exact source or seat of its formation has not been demonstrated satisfactorily. The poison is evidently contained in the fluids issuing from the mouth;

* As this is a topic of the utmost interest to pathologists, and as the lungs were never viewed, before the researches of M. TROLLIET, as the chief seat (although the consecutive seat only, in my opinion,) of morbid appearances in cases of rabies, and as furnishing the poison, the developed effects of which human science has hitherto failed to remove, I here adduce the conclusions at which he arrives: — 1st. "The organs of respiration, and the vascular system in the brain, present constant marks of derangement in rabies. The other organs offer nothing that can be rigorously attributed to this malady. — 2d. The salivary glands, and the cellular tissue enveloping them, present not the least vestige of inflammation, nor any change in their volume, nor in their colour or texture. — 3d. The mucous membrane of the mouth and pharynx are of a pale grey, and are lubricated by a slight moisture: these cavities contain no saliva, nor any frothy matter. — 4th. The larynx is rarely inflamed, the trachea more frequently, especially in its inferior portion; the bronchi always. In rabies, the capillaries of the lungs are injected; and this organ is red and congested. The sensibility of this viscus is also greatly increased; a burning heat, pain, and constriction are experienced — pathognomonic signs of inflammatory action. — 5th. This inflammatory state of the lungs is specific, and arises from the virus of rabies, as the eruption from the virus of small pox; the inflammatory appearances being present in different degrees, in different subjects. These appearances are seated in the mucous membrane of the bronchi and trachea; the cellular tissue and serous covering of the lungs being not affected. — 6th. A frothy mucus is generally found in the parts inflamed; sometimes in the larynx, oftener in the trachea, towards its lower portion; it is generally found in the bronchi, and it may be squeezed from the air-cells. This frothy matter is a product of the inflamed mucous membrane, and is driven over the lips of the rabid person in the last stage of the disease, when the respiration is quick, forcible, and stertorous. — 7th. I consider this frothy matter, thus driven, by the spasmodic expirations, from the air passages over the lips to be the true vehicle of the virus of rabies, and not the saliva; because the salivary apparatus is not the seat of any pain during the disease, and does not present any lesion after death; because the bronchi are inflamed, are the seat of pain, and furnish a diseased secretion; and because, in all contagious diseases, the virus is produced from the part inflamed; as in gonorrhœa, small-pox, &c. The saliva, therefore, is no more the vehicle of the virus of rabies, than the semen is that of the virus of syphilis."

course of practice, I have been called to cases where the concretions obstructing the rectum and anus consisted in one case of brown paper which had been habitually chewed and swallowed; in another of wax, which had likewise been chewed and swallowed; in a third case of sealing wax of various colours which had been likewise swallowed; and in a fourth of chewed cedar of which drawing pencils are made. The first and last of these cases occurred in girls at school, the substances having been reduced to a pulp, and having passed into the bowels, were cemented by mucus into balls so hard as not to be capable of changing their form so as to pass the sphincter without producing great disorder. The second and third of these cases occurred in married women, under thirty years of age, without children; the wax being agglutinated into large hard balls. These concretions were numerous in all the cases, had evidently existed long in the cells of the colon, until the irritation they produced and the treatment adopted had dislodged them, and carried them to the rectum, when they were arrested by the sphincter. Besides these, magnesia, the carbonate of iron, and other substances, may form concretions productive of the disorder, to which attention is now directed.

9. (*c.*) The *treatment* of indurated substances, whether altogether foreign, or partly or wholly formed in the bowels, is generally simple; and if judiciously managed may be brought to a successful issue without much or even any surgical aid. Warm olive oil should be carefully injected; and the concretions, if still retained, should be turned out by the slow introduction of the finger; and the gradual resistance thereby furnished to the irritable contractions of the sphincter will facilitate their expulsion. When the concretions are less indurated, or consist of hardened fæces, they may be broken down by the handle of a spoon, or by a marrow-spoon, and then oleaginous enemata will remove the parts which still remain. As respects the effects produced by *foreign bodies* introduced through the anus, and the removal of these bodies, I must refer the reader to the surgical works enumerated or referred to in the BIBLIOGRAPHY.

10. (*d.*) *Lacerations of the rectum and anus* are not infrequent occurrences. They vary much in their extent, in their seat, and as respects the direction in which they occur. They may be complete or incomplete as regards the coats of the intestine; and they may be limited to either the rectum or anus, or extended to both. The rectum or anus, or both, may be torn partially by the passage of large concretions, or hardened fæcal matters, passed hastily, or after violent straining. Such occurrences are rare; and the laceration is generally *partial* or *incomplete*, or involving merely the inner coats. *Complete laceration* takes place almost always from external injury or accident, and from parturition. *This form* of laceration may be limited to the anus, or not extend above the sphincter; and it commonly is caused by parturition. An instance, however, came under my notice of its occurrence from sitting upon a chamber pot which had been previously cracked. A *second form* is that consisting of rupture of all the coats within the sphincter, the anus, especially at its origin, not being injured. This form may be caused by foreign bodies in the rectum, by an unnatural position of the child during parturition, or by the unskilful use of instruments for this process. A *third form* of laceration consists of a division of the rectum and anus, and is caused by parturition. In this variety the recto-vaginal partition, the perineum, anus, and sphincter are all torn, the rectum and vagina forming one cavity.

11. (*e.*) The *treatment* of partial and complete laceration of the rectum and anus is chiefly surgical. When the laceration is only partial, medical treatment will generally be sufficient. A prudent recourse to olive or castor oil, to oleaginous and demulcent enemata, occasionally to suitable ointments, to the supine posture, and to a spare farinaceous diet, will commonly remove this lesion in the course of a few days. Inattention or maltreatment, a too full diet, or a too heating regimen, may cause partial laceration to be followed by inflammation, or by ulceration, or by abscess, or by fistula — lesions which will be considered in the sequel.

III. INACTION OF THE RECTUM AND ANUS. — SYNON. — *Local Paralysis of the Rectum and Anus, — relaxation or atony of these parts.*

CLASSIF. I. CLASS. I. ORDER. (*Author in Preface.*)

12. DEFIN. — *Retention and accumulation of fæcal matters in the rectum, with constipation and a sense of fulness and weight in the pelvis, and with an inability to expel the contents of the bowels.*

13. This complaint, which is not infrequent in aged persons, especially in old females of sedentary habits, in aged debauchees, and in other persons who have exhausted the energies of the ganglial and spinal nervous systems, has hitherto been confounded with the more common states of constipation. It is moreover the usual form of constipation in connection with palsy, especially with paraplegia and general palsy; costiveness or obstinate constipation thus proceeding not only from various kinds of obstruction in the vicinity of the anus or in the rectum, but also, in a different class of cases, from defective contractility of the muscular coats of the rectum, owing to impaired or lost power of the ganglial and spinal nerves actuating these coats.

14. i. CAUSES. — (*a.*) The circumstances chiefly *predisposing* to this complaint are the usual causes of debility or exhaustion, more especially very advanced age; sexual excesses, masturbation, or excessive voluntary or involuntary pollutions; want of exercise in the open air, sedentary occupations and habits; the rheumatic and gouty diathesis, especially when accompanied by pains in the loins from congestion of the spinal sinuses or veins, and low or nervous fevers, or convalescence from them.

15. (*b.*) The most common *exciting causes*, are neglect of the early intimations to evacuate the bowels, the rectum thus becoming over-distended by fæces and flatus, and the muscular coats thereby losing their powers of contraction; paraplegia or paralytic affection of any kind; hysterical disorders; inordinate sexual indulgences; diseases of the kidneys; congestion of the spinal veins or sinuses, however produced; exposure to cold, or to currents of air, especially when directed on the loins or sacrum, and an excessive use of calomel or aloetic purges. But whatever impairs the vital energy of the ganglia and ganglial plexuses of the pelvic viscera, or whatever suppresses, removes, or diminishes the influence of the spinal

nerves, with which the pelvic ganglia are reinforced, as congestion, inflammation, injury, or structural lesions of the spinal cord, will generally be followed by inaction or paralysis of the coats of the rectum, and generally also with relaxation of the sphincter ani.

16. ii. SYMPTOMS.—Besides the usual symptoms of constipation, the patient feels a weight and distention, sometimes with pain or aching in the pelvis towards the sacrum. The desire to evacuate the bowels is often slight or absent; or if it be experienced, there is an inability to accomplish the intention. In many cases, the retained fæces which are the lowest in the rectum become remarkably indurated, and furnish an obstacle to the evacuation of the portions above. In some of these cases the sphincter ani is so relaxed or paralysed as to admit of the hardened fæces being seen through the open anus. Not infrequently these cases proceed from neglect of local examination, and from purgatives given by the mouth being confided in alone, until a fatal issue ensues; and, if the administration of enemata be entrusted to an ignorant nurse, the nature of the disorder is equally unknown; and these medicines are reported to have been either inefficacious, or immediately returned.

17. If the complaint continues, without removal of the fæcal accumulations, ulceration or sphacelation of some portion of the parietes of the rectum, with absorption of excrementitious materials into the circulation, is a common result; occasioning low irritative fever, pains about the sacrum, vomitings, suppression or incontinence of urine, restlessness, followed by coma and nervous symptoms, varying with the circumstances and complications of individual cases. In some instances, violent pains, occurring in paroxysms, are complained of towards the close, or at an advanced stage of the disease, and dart down into the pelvis and to the anus; but contingent phenomena vary remarkably with the age of the patient and the morbid associations or peculiarities of the case.

18. iii. COMPLICATIONS.—This affection occurs much more frequently in connection with some other malady, than as a simple or primary disorder. In the latter form, it is occasionally met with in aged persons or exhausted constitutions, more especially in sedentary females; and it may continue until the unfavourable issue mentioned above (§ 17.) supervenes. It is a common attendant upon paraplegia, partial or complete, or from whatever cause, and upon general paralysis, and the palsy of the insane; and, in these maladies, it is often associated with relaxation of the sphincter ani, fæcal accumulations being thereby prevented, the evacuations passing off involuntarily, or as position and gravitation may favour their exit. It is also not infrequently complicated with diseases of the uterus and ovaria; with displacements or enlargements of the uterus; or with diseases of the kidneys or urinary bladder, or with enlargement or other lesions of the prostate gland. It is often associated with impaired function of the rest of the digestive canal, or with torpor, obstruction or organic lesions of the liver.

19. iv. TREATMENT.—In the more simple states of this disorder purgation requires to be aided by stimulating enemata. Often a combination of disulphate of quina with the purified extract of aloes, or this latter with the compound galbanum pill, or these three medicines conjoined, will sufficiently excite the action of the rectum. If these fail, the more violent cathartics, as croton oil, the extract of elaterium, &c., will occasion more disorder than benefit; for, if this latter be derived, it is only temporary, inaction of the bowel being increased by them. Suitable enemata are generally required, and the addition of the spirit of turpentine to the injection is usually beneficial. It is not uncommon to find the rectum enormously distended with hardened fæces, when proceeding to administer an enema; but the state of the rectum and anus ought to be previously ascertained; and the accumulation should be removed, at least in part, by direct and mechanical means, before an injection is administered. The kind of enema adopted ought to depend upon the circumstances and complications of the case, and the effect produced; but a daily recourse to it is generally requisite.

20. In *complicated cases*, the treatment should also be directed to the associated malady; but, in these generally, the means now recommended will prove more or less serviceable, although others may be required in addition. In all cases, the state of the urinary functions requires attention; and undue accumulations of urine in the bladder must be prevented. The condition of the sphincter ani, and of the sacrum, or other parts unduly pressed upon, should be ascertained; for, when the sphincter is relaxed, much inconvenience and increase of disorder, with bed-sores, &c., will follow, and will with difficulty be prevented, although the greatest care be exercised, especially in aged, paralytic, and debilitated persons. In these persons especially, not only are the muscular coats of the bowel paralysed, but the secretions from the villous surface and mucous follicles are remarkably diminished, thereby favouring induration of the contents, and delaying or preventing their passage from the bowel. In these cases, the injections, whether saponaceous, saline, oleaginous, or terebinthinate, may be advantageously thrown up as high into the colon as possible by means of the flexible tube, as recommended by Dr. O'BEIRNE, for in such instances fæcal accumulations may exist far above the rectum. The combination of di-sulphate of quina, aloes, and compound galbanum pill, recommended above (§ 19.), or the two former with inspissated ox-gall, as advised by me in 1832, will generally restore the action of the bowels, unless in extreme or seriously complicated cases.

IV. INFLAMMATIONS OF THE RECTUM AND ANUS.—SYNON. *Proctitis* (from πρωκτος, anus); *die Afterentzündung*, Germ.

CLASSIF.—III. CLASS. I. ORDER (*Author in Preface*).

21. DEFIN.—*Pain and heat in the anus, extending up the sacrum and pelvis, with continued tenesmus or straining.*

22. Inflammations of the rectum and anus have been most unaccountably neglected by medical and surgical writers, and too generally overlooked in practice, more especially by those empirical physicians who plume themselves upon being "bold" or "active" practitioners, and who are so on inappropriate occasions, "ad captandum vulgus," rather than from a conviction of the benefit derived by those who are subjected to the infliction. *Proctitis*, in some form or other, I

have frequently found produced, either as a sequence, or as a complication, of some other disorder, by "heroic" practitioners, who claim for themselves a special consideration and notoriety, —actually produced by the excessive doses, or frequent repetition, or prolonged use, of those substances which irritate the lower bowels. How remarkably indebted must the surgeons of the present day, and indeed of the last half century, have been to physicians and others, for their frequent recourse to large doses of calomel and other medicines which have either excited or perpetuated, or in both modes developed, not merely inflammation of the rectum and anus, but also the various organic lesions about to be noticed as consequences of inflammation of these parts.

23. *Inflammations of the rectum and anus* are not of one only type or kind as respects the nature of the morbid action, and the consequences which follow. As I have shown when treating of INFLAMMATION, and of DYSENTERY, proctitis may be *sthenic*, or *asthenic*, or *acute*, *sub-acute*, or *chronic*. The inflammation may commence in the rectum and extend even to the verge of, and around the anus; or it may begin in this latter situation and mount upwards, not merely to the rectum, but also to the colon, and even to the cæcum and small intestines. In all cases, and these by far the most numerous, the disease extends to the colon and cæcum, and often still further; constituting, according to the character of the constitutional and local symptoms, the forms of DYSENTERY which I have so fully considered, as not even now to admit of any addition, alteration, or correction. When inflammation is confined chiefly to the rectum and anus, although closely allied to dysentery, it is nevertheless more or less distinct from that malady, more especially when it is sub-acute or chronic, and is produced, as I have seen it in numerous cases, by the treatment which has been either adopted on erroneous principles, or carried too far. When thus produced by medicinal agents, proctitis may commence in the rectum, or in the lower part of the colon and rectum, or extend from one to either. When it is caused by agents acting externally, or locally, upon the anus, it may be then limited to this part, if the agents are not contaminating; but if they are infecting or contaminating, the rectum is soon invaded, and the inflammation, always then of an asthenic and spreading character, extends much higher, and to an indefinite extent.

24. i. SYMPTOMS OF PROCTITIS.—The phenomena of this disease vary with the cause, with the constitutional powers of the patient, and with the severity of the morbid action.—*A. Acute sthenic Proctitis* is attended by heat and pain at the anus, shooting or extending to the lowest part of the back, or under the sacrum; and by a continual desire to go to stool, with straining, and with the passage merely of mucus, sometimes streaked with a little blood. In some instances an exudation of lymph, similar to that in croup, takes place, and is thrown off in a more or less consistent or membrane-like form. If fæculent matter be passed at any time, it is usually with much increase of pain, and after having been retained for a longer or shorter time by the irritable and constricted sphincter; and the passage of pellets of fæces, with the straining or tenesmus, often occasions a slight prolapse of the inner coats of the bowel, which appears swollen, red, hot, and injected, partially covered with mucus, or with exudations of lymph, and with the mucous follicles enlarged. When the prolapsus is more considerable, and is accompanied with spasmodic constriction of the sphincter, the pain and restlessness are much increased, and shoots upwards along the sacrum in severe paroxysms, a distressing aching being constant in this latter situation.

25. The *symptomatic disturbance* varies with the constriction and severity of attack. There may be neither rigors nor chills at the commencement, unless the disease follow the local action of cold, or the cause be of a severe character. But more or less febrile action, with a white or loaded tongue, heat of skin, impaired secretion and excretion; scanty urine of a high colour, voided frequently and with difficulty, owing to the extension of irritation to the prostate gland and neck of the bladder; an accelerated, full, or strong pulse; loss of appetite, but rarely vomiting, unless the disease has been neglected, or fæcal matters have been long retained and largely accumulated, and constipation of the bowels.

26. The *terminations* of this form of proctitis are—1st. resolution;—2d. In hæmorrhagic exudations, which may resolve the inflammation; or, if the disease be associated with a varicose state of the hæmorrhoidal veins or hæmorrhoids, as often is the case, in a hæmorrhoidal discharge; —3d. In ulceration of the inner coats of the bowel, the ulceration commencing either in the mucous follicles, the ulcers being either few in number or several; or in the abrasion of the villous coat, the ulcer being single, or very few: —4th. Rarely in sphacelation, unless that portion of the inner coats of the bowel which has protruded and been strangulated by the sphincter;—5th. In abscess in the vicinity of the anus, or external to some portion of the parietes of the bowel, or in the connecting cellular tissue between the rectum and neck of the urinary bladder, or between the rectum and vagina, the abscess ultimately terminating in fistula; or in one or more small abscesses in the connecting cellular tissue of the rectum or anus;—6th. In inflammation of the hæmorrhoidal veins, especially when the disease is complicated with hæmorrhoids;—and 7th. In chronic inflammation of the rectum and anus, and the several structural changes consequent upon it. (§§ 43. *et seq.*)

27. *B. Sub-acute and chronic Proctitis* may be either primary or consequent upon the acute form now described, the symptoms of the latter gradually subsiding to the sub-acute and chronic states successively. If the chronic form become prolonged, various changes of structure and complications may follow, attended by distressing symptoms; and, if the complaint receive not due attention, the life of the patient may be endangered.—(*a.*) *Sub-acute sthenic proctitis* is characterised by similar symptoms to those above enumerated, the chief difference consisting in their milder form; and, if not appropriately treated, in their longer duration. This form is not infrequent in females; and in them the occurrence of the catamenia is often followed by resolution of the inflammatory action. With the exception of sphacelation, the same *terminations* as I have stated to follow acute sthenic proctitis

may also follow the sub-acute form, but generally as consequences of neglect or improper treatment, which often occasion this form to pass into the following and its consecutive organic lesions.

28. (*b.*) *Chronic Proctitis*, although often consequent upon the acute or sub-acute states, may also occur primarily, especially in persons who are subject to hæmorrhoidal affections, or who have habitual recourse to calomel or aloetic and resinous purgatives, or who are exposed to the influence of certain noxious agents. This form of the disease may be seated chiefly in the mucous follicles, or in the mucous surface itself, or it may extend, especially when it is of considerable duration, to the connecting cellular tissue, occasioning more or less tumefaction or thickening of the parietes of the bowel. Chronic proctitis is more frequently a complicated, than a simple affection; and, when associated with other disorders, as with hæmorrhoids, with leucorrhœa in the female, with spasmodic stricture, or with fissures of the anus, it may be either the primary or secondary affection. It is generally attended by more or less tenesmus or pain and straining at stool; by a sense of aching or pain under the sacrum; by slight prolapsus of the inner coats after alvine evacuations; sometimes by dysuria and frequent micturition, and often by the exudation of mucus from the anus — *Proctorrhœa*, of some authors, — *Medorrhœa ani* of J. P. FRANK, — especially when the irritation is kept up by the presence of ascarides in the rectum, or when the mucous follicles are affected, or when the disorder is associated with leucorrhœa.

29. The *Terminations* of chronic proctitis are, 1st. Resolution; — 2d. Ulceration, generally commencing in the mucous follicles; — 3d. Fistulous ulceration, with or without abscess or purulent collection in the vicinity of the anus; — 4th. Fissures of the anus, generally in connection with hæmorrhoidal tumours, or spasmodic stricture of the rectum, or with both; — 5th. Tumefaction, thickening, and ultimately induration and constriction of the coats of the rectum; and 6th. Ulceration, associated with thickening, or with induration and constriction, or with all these changes.

30. *D. Asthenic Acute Proctitis* may commence with or without rigors; and, although it occurs chiefly in delicate, exhausted and cachectic persons, it may affect any temperament or constitution when the contaminating or infecting exhalations which usually produce it are directed against the exposed anus; as when persons frequent privies which contain accumulated fæces, and emit an abundant infecting vapour. — *a.* This form of proctitis is attended by many symptoms of the sthenic acute form; but the symptoms are more severe, the suffering more acute, the spasm of the sphincter is more severe, or occurs in more distinct paroxysms, and the mucous discharge following the straining is more copious, watery, ichorous or bloody, and more offensive than in the sthenic form. The disease, moreover, is rarely limited to the rectum, unless the treatment be prompt, energetic and judicious; but extends along the colon, and assumes all the characters of asthenic dysentery, with the constitutional symptoms and terminations described when treating of this form of that malady (see Art. DYSENTERY, §§ 20, *et seq.*). Asthenic proctitis is generally attended by much fever; a quick, soft or weak pulse; by much heat of skin; a foul or loaded tongue; by tenesmus, dysuria, or frequent micturition; by retention of fæcal matters, and many of the phenomena of adynamic fever. Prolapsus of the inner coats of the bowel is frequent; and, if this be attended by violent or continued spasm of the sphincter ani, sphacelation, foul ulceration, exudations of an offensive sanies, implicating more especially the prolapsed parts, are common results.

31. *b.* The *terminations* of this form of proctitis depend upon the period at which treatment has been adopted, and the nature of the means employed. Beside the terminations already mentioned (§ 26.), the passage of the disease into dysentery, especially the asthenic form, contamination of the circulating fluids, vital exhaustion, extensive ulcerations, sphacelation, and the other consequences of dysentery, may supervene.

32. *c.* The *complications* of asthenic proctitis are often serious, and demand careful examination and treatment. The neck, and even the parietes of the urinary bladder, with the prostate and urethra, are not infrequently implicated in the male, causing frequent and painful micturition, or even retention of urine; and the vagina, os and cervix uteri, are even still more frequently affected in the female; occasioning severe paroxysmal pains, referred to the vagina and uterus; and sometimes also much disordering the urinary functions.

33. *E. Syphilitic* and *gonorrhœal proctitis* are occasionally observed, especially in females of a certain class; but these specific forms of disease require no further notice at this place, than that the practitioner should not mistake their nature. They are more frequent in females than males, chiefly owing to the readiness with which the infecting virus may be communicated, by proximity of parts and by position, from the vagina to the anus. Syphilitic proctitis often speedily passes into ulceration, &c. within and around the verge of the anus; whilst the gonorrhœal form of the disease is attended with much excoriation, swelling, and discharge at the orifice of the anus, and at the internal surface of the nates adjoining the anus.

34. *F. Inflammation*, often with extensive *excoriations of the anus*, is not infrequent *in infants* and *young children*. In some cases the inflammation seems to originate externally to the anus, or at its external margin; and is either symptomatic of disorder of the digestive canal, caused by the state of the mother's or nurse's milk, or by improper food, or by disordered secretions and excretions; or it is more directly produced by want of cleanliness, and the accumulation of irritating sordes in this situation. In plethoric, gross, or unhealthy children, the inflammation almost threatens the adhesion of the opposite surfaces of the nates. In those cases, the disorder is attended by much fever — by a hot, dry skin, and a full, excited pulse. In other instances, the inflammation extends to the anus from the rectum, and then the child has remarkable straining, with very scanty mucous evacuations tinged with blood; and often also dysuria. This state of the affection is not infrequent during weaning or dentition, and is often symptomatic of disorder of the digestive canal at these periods, or is caused by the nature or the excess of the ingesta In some cases, the

disease assumes a sub-acute asthenic form resembling aphthæ, upon which it not infrequently supervenes, or with which it is complicated; more or less disorder or marked lesion, apparently extending along the whole digestive canal, but becoming more developed and apparent at both the entrance and outlet — in the mouth and lips, and in the anus, where the vital action of the parts is modified by the copious accession of sensory and motory spinal nerves (see Art. THRUSH).

35. ii. CAUSES. — (*a.*) The *predisposing causes* of proctitis are the irritable and sanguine temperaments; an irritable or susceptible state of the intestinal canal; the existence of worms in the intestines; a full habit of body in connection with hæmorrhoidal affections; venereal excesses and voluntary or involuntary pollutions; diseases of the prostate gland or neck of the bladder; and morbid or long retained alvine secretions and excretions. — (*b.*) The *exciting causes* are chiefly those which act through the medium of the intestinal canal; and those which act externally or locally. Of the former, the ingesta, medicinal and dietetic, are the most frequent and important. Calomel and other preparations of mercury in large or too frequent doses, or in prolonged courses; arsenic similarly prescribed; aloetic and resinous purgatives habitually or frequently taken; hypercatharsis, however produced; the prolonged or excessive use of emmenagogues; substances swallowed with the food, accidentally or otherwise, which irritate or penetrate the coats of the rectum, as fish-bones, or the spiculæ of other bones; the husks, seeds, or stones of fruit; and the very hot and least soluble spices, when taken in excess. Other substances accidentally swallowed, which irritate mechanically the rectum or anus; morbid or retained secretions and excretions, accumulated fæces, concretions formed in the bowels, hæmorrhoidal affections; and the irritation of worms, are also occasionally exciting causes of this complaint.

36. The external agents are chiefly injuries, accidents, wounds or operations, implicating the rectum or anus; the contingencies of parturition and the puerperal state; the administration of acrid or stimulating enemata, injections or suppositories; injury sustained by the bowel during the administration of enemata; abstracted animal heat by sitting on cold seats, on stones, or on the ground; currents of cold air; the application of gonorrhœal or syphilitic poisons, or other infecting agents; and frequenting foul privies where the fæcal accumulations are great, and where the foul exhalations rise against, and infect, the anus during defæcation. Of the influence of this last cause of proctitis I have observed several proofs in the course of practice. The inflammation which has resulted has generally assumed the form of asthenic dysentery (see DYSENTERY, §§ 20. *et seq.*); and when females have been exposed to this cause, not only has asthenic proctitis passing into dysentery been the occasional result, but also asthenic vaginitis, sometimes with asthenic hysteritis, attended by acute pain and by a copious or an offensive vaginal discharge, this complication appearing most frequently and remarkably in married females.

37. iii. TREATMENT should differ most remarkably with the activity and character of the inflammatory action, and the nature of the predisposing and exciting causes. — *A.* In *sthenic acute proctitis*, local depletions, especially cupping over the sacrum, leeches to the perinæum and around the anus; cooling and demulcent aperients; the warm bath, semicupium or hip-bath, followed by cooling diaphoretics, and fomentations, with an antiphlogistic regimen, are the most efficacious, and generally remove the disorder in a few days. If much pain and tenesmus continue after depletion, the compound ipecacuanha powder, or simple ipecacuanha, with henbane, extract of hop or of poppy, ought to be given in the form of pill, the ipecacuanha in as large and frequent doses as the stomach will tolerate; and, having allayed the irritability, the bowels should be evacuated by fresh castor or olive oil; or by sulphur and magnesia, aided by confection of senna, or by a glass of lemonade, taken soon after the magnesia, or by a demulcent, laxative, or oleaginous enema.

38. *B.* The *sub-acute* and *chronic states* of the complaint generally yield to the same means as just advised; local depletions to a less amount being usually sufficient; but these should vary with the habit of body and circumstances of the patient. Ipecacuanha, cooling diaphoretics, warm baths, and emollient laxatives, with demulcent and anodyne enemata are generally beneficial. If external irritation, heat, or excoriations are experienced at the anus, a cooling and anodyne lotion, as a solution of the diacetate of lead, with vinum opii and acetic acid, will give much relief, and may be kept applied for a considerable time by means of pledgets of lint. The secretions and alvine excretions, especially the biliary, should be promoted by means of hydrargyrum cum creta, or Plummer's pill, conjoined with ipecacuanha and soap, interposing a dose of castor or olive oil; or a demulcent and oleaginous enema.

39. *C. Asthenic proctitis* rarely admits even of local depletions, unless in plethoric persons. As the chief danger in this form of the complaint proceeds from the rapid extension of the disease along the rectum to the colon, the principal indication is to prevent or limit the extension by such means as experience has shown to be most efficient in this mode of operation. I have found the warm-bath, or hip-bath, followed by a warm terebinthinate embrocation applied over the sacrum or the hypogastrium, and the following pills, amongst the most efficacious means. As soon as the more painful symptoms, especially the spasm of the sphincter ani, were relieved, or even without waiting for such relief, the subjoined draught was also administered.

No. 328. ℞ Pulv. Ipecacuanhæ; Quinæ Disulph. Camphoræ, āā, gr. j. Extr. Humuli, vel Extr. Gentianæ, gr. iij.; Confect. Aromat. gr. ij.; Mucilag. Acaciæ, q. s. ut. Fiant Pilulæ, ij. quarta vel quinta quaque horâ sumendæ.

No. 329. ℞ Olei Terebinth., Olei Ricini, āā, ʒss.; Aquæ Menthæ Virid. ℥vjss.; Tinct. Capsici, m. iij. ut. Fiat Haustus.

40. Demulcent and anodyne enemata are always beneficial, if early employed; or before ulceration or sphacelation of the internal coats of the bowel has commenced; but the utmost care ought to be taken in administering an enema, lest the pipe of the instrument injure the swollen, softened, and tender parts along which it is passed. In every other respect the treatment should be identical with that advised for *asthenic dysentery*, especially if the morbid action has advanced to

the colon and cæcum, or has continued any time. (See art. Dysentery, §§ 88. *et seq.*).

41. *D. Inflammations and excoriations of the anus and rectum in infants and young children* (§ 34.) should be treated with a strict reference to this cause. The diet of the infant, and even of the nurse, should be changed or corrected; the secretions and excretions improved and promoted; and, after the warm bath, emollients, &c., the zinc ointment, or lead ointment, or cooling lotions, or other means which the peculiarities of the case require, should be applied. In most of these cases, more or less constitutional disorder is associated with disease of the alimentary canal; and this latter is seldom confined to the rectum and anus; the colon, or the digestive organs generally participating more especially in the existing derangement. In these circumstances, the hydrargyrum cum creta, conjoined with ipecacuanha, with small doses of rhubarb, and with absorbent powders, or other ant-acids, will frequently prove most beneficial; and sometimes equal parts of precipitated sulphur and carbonate of magnesia, to which powdered liquorice root and cinnamon are added, in quantity sufficient to render the whole more pleasant, may be taken in milk or in water.

42. *E. The specific—gonorrhœal and venereal—forms of inflammation of the anus and rectum*, should be treated conformably with the principles which guide the treatment of these maladies, in other situations and circumstances. The local affection will, however, require much of the soothing means already advised for other inflammations of these parts:—the gonorrhœal especially, local depletions, saturnine or cooling and anodyne lotions, &c.; and, internally, the balsams, especially copaiba, powdered cubebs, or a decoction of the *Achillea millefolium*. Clysters are of doubtful advantage in the specific states of the disease, as they may favour the extension of the specific infection from the anus to the rectum and lower parts of the colon.

43. iv. Itching of the Anus.—*A.* This is generally a symptom only of diseases of the digestive canal, or of the rectum and parts in the vicinity. It is often, however, so distressing as to form the most prominent disorder; and is then a most obstinate one to remove. It is most commonly caused, at all ages, by ascarides in the rectum, by other intestinal worms, and by chronic eruptions around the anus. It sometimes follows recovery from dysentery. It frequently precedes and accompanies hæmorrhoidal affections; and it often attends and follows the cessation of the menstrual discharge. It is often attended by more or less of mucous discharge from the rectum—or "*medorrhœa ani*." Pathologically, it may be viewed as an indication of either irritation of the intestinal canal, especially of the rectum, or congestion of blood in the rectum or anus, or cutaneous eruptions near the verge of the anus. It is often produced by the accumulation of fæces in the rectum and colon; by the abuse of calomel, or of aloes, or of other purgatives which act chiefly on the rectum; by various exciting emmenagogues; by irritation or enlargement of the prostate gland, and by self-pollution.

44. *B.* The *treatment* should be directed to the pathological and exciting causes, and to the complications of the case. Local bleedings are sometimes required, and these are often advantageously followed by cooling lotions, as the acetate of lead, with acetic acid, and the tincture or wine of opium. The yellow wash, or weak solutions of the nitrate of silver, and the other means advised for the chronic cutaneous eruptions affecting this part, should be employed when any one of these is the cause of the itching. In the more obstinate cases, clysters containing turpentine will be found most efficacious; and lotions, or a wash, with a saturated solution of the bi-borate of soda, will also prove most beneficial, and appropriate to all the circumstances in which the symptom appears.

45. v. Mucous Discharge from the rectum.—*Medorrhœa ani*, J. P. Frank—is often caused by the same pathological states as produce itching of the anus (§ 43.). *A.* It may proceed also from a chronic state of inflammation of the lower portion of the rectum; and precede, accompany, or follow hæmorrhoidal attacks, the hæmorrhoidal flux being very frequently followed by this discharge. When caused by inflammatory irritation or congestion, it may prove a substitute for the sanguineous evacuations attending hæmorrhoids. It is distinguished from gonorrhœa affecting the anus, or "venereal blennorrhœa," by its tenacious state and transparent appearance, which it commonly retains.

46. *B.* The *treatment* of this discharge depends upon the cause. It is often produced by the abuse of calomel and aloes, and by resinous purgatives and emmenagogues, and is readily cured by relinquishing the use of these. It is a frequent consequence of the congestion, or local determination of blood produced by masturbation; and hence it should excite suspicion of this vice, the existence of which will render treatment inefficacious, but the relinquishment of which will alone remove the disorder. When it follows proctitis, or dysenteric attacks, or attends hæmorrhoidal tumours, or follows sanguineous evacuations from these tumours, the treatment advised for Hæmorrhoids will then be required; and when it is caused by intestinal worms, the treatment prescribed for these parasites is then necessary. In many cases, the means recommended for itching of the anus, or for chronic proctitis, will remove this affection.

47. vi. Abscess of the Rectum and Anus.—*A.* Abscesses may form in connection with the rectum or anus, or with both, either consecutively of some form of inflammation of these parts, or from the extension of disease from adjoining parts, or secondarily from phlebitis or from purulent absorption.—(*a.*) When either of the forms of inflammation terminate in abscess, the surrounding and connecting cellular tissue is the seat of the purulent formation. If the abscess form near the anus, it is formed in, and confined by, the surrounding adipose substance. The abscess may be *between* or *external* to, the coats of the rectum: if the former, it is generally very small, or several may exist; if the latter, it is much larger, and is generally single. In cachectic habits it may be very large, and spread to a dangerous extent.

48. Small abscesses, which form in the parietes of the rectum, or superficially near the anus, are generally consequent upon inflammatory irritation in the mucous membrane or its follicles; and in the more healthy subjects, and when the treatment is judicious, they generally terminate without

ducing any of the consequences, to which the larger purulent formations often lead. When the mucous follicles of the rectum or anus are irritated, either by the nature of the excretions which pass over them, or by medicinal excitants, or by the morbid matters existing in the blood that they are partly concerned in eliminating, the irritation may, especially when occasioned by this last cause, rapidly pass into ulceration, which, if it extend to the connecting cellular tissue, may be followed either by purulent collections, or by fistula, or more commonly by both these in succession.

49. (*b.*) Abscesses seldom form externally to the coats of the rectum, or to the sphincter ani, independently of inflammatory irritation of the rectum or anus, or of the urinary and sexual passages. A small abscess, or boil, may however appear, independently of irritation of these parts, external to the sphincter, or near the anus, owing to want of cleanliness or to some other cause; and may, if opened early, and otherwise properly treated, in no way implicate the adjoining canals or their outlets; but, if neglected, or if suppressed externally, it may extend upwards or along the rectum, especially in cachectic habits, and ultimately perforate the parietes of the bowel above the sphincter, and be followed by fistula. Although an abscess may occasionally thus originate, and with an apparent independence of any irritation or disease of the adjoining canals or of their outlets, I believe that instances are rare in which these affections, either of the mucous surfaces, or of the follicles, are entirely absent, these affections proving the exciting cause of the inflammatory action and suppuration external to the rectum or anus.

50. (*c.*) Irritation or inflammation, passing into abscess in or near the rectum or anus, although commonly originating in those parts, and produced by the causes mentioned above (§§ 35, 36.), frequently proceeds from disease — from inordinate excitement, irritation, inflammation, or other lesions, of adjoining parts. In females the abscess may be a consequence of irritation in the sexual passages, and be seated in the anterior parietes of the bowel, or in the recto-vaginal partition, or in the perinæum, and may point or open into either canal or externally, according to its position. In males, inflammatory irritation or diseases of the urethra, of the prostate gland, or of the neck of the bladder, may extend to the adjoining cellular tissue, and endanger the integrity of the rectum by exciting inflammation of, and abscess in or extending to, this tissue. Even the means used to cure disease of the urinary and sexual organs, in both sexes, may excite inflammation or irritation, which will extend in this direction and terminate in purulent formation, which may open into the rectum. Abscess in the vicinity of the rectum or anus may, moreover, depend upon disease of some one of the pelvic viscera, or upon disease or caries of a portion of bone in the vicinity; but these are comparatively rare occurrences, or causes of abscess in this situation. It should not, however, be overlooked, that an abscess may appear near the anus, or may partially surround, or open into the rectum, owing to the extension of disease, and to purulent extension and infiltration, from the vertebræ — the abscess being, in such case, merely a variety of psoas abscess, proceeding from inflammation of the intervertebral spaces, or from caries or tubercular disease of the bodies of one or more of the vertebræ.

51. (*d.*) Abscess, or abscesses, may form in the rectum or anus, from inflammation of the veins of these parts, or of a hæmorrhoidal tumour, or of a dilated or varicose vein, the purulent collection being more frequently external to the vessel, or in the surrounding cellular and adipose tissues than within, or involving the coats of the vein. It is not improbable, that inflammation of the hæmorrhoidal veins, when commencing in their internal or serous membrane, may sometimes extend more or less along them, and contaminate the blood; or cause coagulation of the fluid in them, or other lesions fully described in the article on the pathology of the VEINS, and be associated with purulent collections in their course, either internal or external as respects their parietes; but these results are certainly not so frequent as may be expected from the exposure of these vessels to the several causes of irritation and inflammation, which so often act upon the rectum and anus, and influence the circulation through the hæmorrhoidal veins, both in health and in disease. It still more rarely happens, that secondary collections of matter form near the rectum or anus in consequence of purulent absorption, the few instances of abscess in these situations which have occurred in the puerperal state being those in which inflammation of the veins of the uterus or of the appendages has extended to the veins and cellular substance adjoining, and has implicated those parts in or near the rectum or anus.

52. *B. The symptoms of abscess* near to, or implicating, the rectum or anus vary remarkably, in severity and character, with the causes of the inflammation of which this is the consequence, with the severity of the inflammation and the extent of the abscess, in no small degree with the particular situation of the abscess, and with the constitution and habit of body of the patient. The symptoms are often, at first, those of proctitis; especially when the disease commences in the rectum or anus itself. But, when the abscess proceeds from inflammation of the adjoining parts, passages, or outlets, or when it is so external to the rectum or anus as at first not to implicate these parts, little inconvenience is experienced there until the outlet is pressed upon, or consecutively inflamed by the progress and distention of the purulent collection.

53. When the abscess is apparently, or even really unconnected with the bowel, or sexual or urinary passages, and is at some distance from the anus (§ 49.), it generally appears in the form of an ordinary boil, and proceeds with central hardness, swelling, redness of a dusky tint, and throbbing, with symptomatic fever, varying in character and severity with the constitution of the patient. If the abscess be of a sthenic nature, the attendant fever is more or less inflammatory, and the tendency to point externally is manifest; but, if it be asthenic, or the constitution cachetic, the local inflammation and the matter produced by it may be diffused, and isolate a portion of the parietes of the rectum, or of the sphincter, and disconnect it from the adjoining parts. In these cases, the constitutional symptoms are always adynamic; and, however frequent the pulse, the vital powers are more or less depressed. In some of these, the abscess will hardly point externally;

or if it thus point, it will do so imperfectly, or assume the character of carbuncle. When the abscess forms near the side of the anus, and much redness or swelling and pain extend to the buttock, with considerable fever, then the more painful symptoms subside upon the formation of matter, especially in the sounder constitutions; and throbbing, chilliness, followed by a disposition to perspirations, with external pointing of the abscess, are chiefly experienced. If, however, the matter is more diffused, if the disease is more asthenic, if the constitutional powers are weak or exhausted, if the superficial appearance of the abscess is more carbuncular, and if more than one opening have appeared on the surface, both the local and general symptoms may be aggravated, or at least not abated; and, with the diffusion of the local lesion, the adynamic fever seriously if not dangerously increased.

54. The severity of the symptoms and the consecutive evils are much increased when the abscess is consequent upon changes of the coats of the rectum, or upon ulceration of the mucous follicles of the rectum or anus, or upon inflammation of hæmorrhoidal tumours, or of the hæmorrhoidal veins; for, in these circumstances, not only are the local changes more complicated, but the constitutional affection is more severe, and the tendency to terminate in fistula, if not in still more serious changes, much greater. Much, however, in respect of severity of local and general symptoms, will depend upon the constitution and habit of body of the patient, and upon the exact seat of the local change. Integrity of vital power will prevent a dangerous extension of the mischief, whilst depressed or exhausted energy, and an impure state of the circulating fluids, and their several concomitants, will increase the evil. The exact situation of the abscess will also remarkably affect the symptoms. If the matter form on one of the sides of the anus, the symptoms will be much less severe than in any other situation: they will be severer if it forms posteriorly; and still more severe if it collects anteriorly; as in this last situation it implicates parts of greater sensibility than in the other situations; and, in the male especially, it involves parts concerned in very important functions — whether extending merely to, or originating in, these parts — and interrupts more or less painfully, and even seriously, their offices. The abscess may in this situation involve the prostate gland, or neck of the bladder, or the urethra, or the vesiculæ seminales, either primarily or consecutively, and thus interrupt the excretion of urine, or cause retention of it, with various associated phenomena.

55. In females, the symptoms are seldom so severe as in the male, especially when the abscess is anterior to the anus or points in the perinæum; and yet I have seen, in two cases, of which strong females of a sanguine temperament were the subjects, both the local and the constitutional symptoms most acute, the abscess having been seated high in the recto-vaginal partition. In such cases, the abscess will not point in the perinæum, but either in the vagina or rectum, according as the parietes of either is primarily or chiefly affected, or as the irritation or cause existed in the one canal or in the other; but when pointing in either direction, perforation of the parietes is generally the consequence, and the risk of fistula being the result is great, especially if the rectum be perforated, and the constitution be at all in fault.

56. vii. Ulceration of the Rectum.—*A.* Ulceration of the coats of the rectum is not infrequent, especially in the course, or as a consequence, of acute or chronic dysentery, of diarrhœa, especially of colliquative diarrœha, and of tenesmus. It may take place as a termination of one of the forms of proctitis described above, and it may be either the consequence or the cause of abscess of the rectum or anus. It is frequent in the course of tubercular formations in the lungs, and less so in the advanced progress of organic diseases of the liver. In the former, it is often productive of fistula, having previously occasioned more or less suppuration, or distinct abscess in some cases, or a less obvious collection of matter in others; and it generally commences in the mucous follicles, and is often caused by the state of the blood consequent upon softening of tubercles in the lungs, and the absorption of tubercular matter. Ulceration may also follow the opening of an abscess into the rectum, when the matter proceeds from inflammation of adjoining parts, especially of those already enumerated (§§ 49—51.). It may possess asthenic or reparative character, in which case a favourable issue soon takes place; or it may present an asthenic or spreading form; or it may even assume a sloughing or rapidly disorganising state. It may, moreover, be specific, or venereal.

57. *B.* Ulceration of the rectum or anus is more frequently a complication of other maladies, as of those of the lungs, liver, &c. than a primary and simple lesion. It is often associated with other changes in the rectum — with inflammation of the rectum, or of the colon, or of both; with prolapsus ani, with fissure of the anus, with stricture and thickening of the parietes of the bowel, with hæmorrhages from the rectum, of which it is often the cause, and with hæmorrhoidal tumours, internal or external. It is often complicated with, or consequent upon, thrush and excoriations of the anus in children (§ 34.); chronic dysentery and diarrhœa, at all ages, and in all climates; and disease of the mesenteric glands. It is not infrequently associated with lesions of the urinary and genital organs in both sexes; and with tubercular formations in different parts of the body, but more particularly in the lungs.

58. *C. The causes of ulceration* of the rectum are the same as those which occasion proctitis or abscess of the rectum and anus; more particularly the several diseases just mentioned as often associating with them these lesions, as tubercular formations in the lungs or in other parts; disease of the liver and digestive canal; hectic and other fevers; the several kinds of dysentery and diarrhœa; local irritants, and septic or contaminating vapours directed on the anus and rectum in foul privies; substances lodged in the rectum; operations and injuries implicating the rectum or its vicinity; certain kinds of ingesta, both medicinal and poisonous, taken too frequently, or in too large doses, as calomel, arsenic, &c.; scurvy and morbid states of the blood; and excessive sexual indulgencies. (See §§ 35, 36.)

59. *D.* The *symptoms* of ulcerations of the rectum are often those of chronic proctitis, especially tenesmus, the discharge of puriform, or a mixture of purulent, sanious, and mucous matters in the stools; more or less pain during the passage of

the fæces, often with partial prolapsus of the inner coats of the rectum, and with more or less blood, sometimes a little only, following the fæculent evacuation. If the ulceration exist near to the anus, it may be associated with some degree of fissure; and a sanious or puriform discharge may either exude constantly, or be discharged at intervals from the anus. When the ulcer is considerable and low in the rectum, it may be felt upon the examination; some degree of thickening, with slight induration of the edges, and irregularity of the surface, serving to distinguish it. When it is beyond the reach of the finger, or above the sphincter, its existence may be inferred from the history of the case, especially from the appearance of purulent, or sanious matter, or of blood in the stools, but unmixed with the fæces; from the circumstance of these discharges having followed symptoms of proctitis or of abscess, or attacks of dysentery or chronic or colliquative diarrhœa; from the pain under the sacrum or pubis just before or during evacuation of the bowels; and from the partial prolapsus often attending fæcal evacuations. But it is rather from the association of several of these, than from either singly, that this change is to be inferred. (See art. HÆMORRHAGE —*from the Intestines*, &c. § 197.)

60. *E. Syphilitic ulceration* of the rectum or anus is a general attendant as well as consequence of syphilitic proctitis. It occurs most frequently in females, owing chiefly to the proximity of the infecting and infected surfaces. The specific characters of the syphilitic ulcer are often, but not always, present. When these are absent, as well as in other circumstances, the history of the case, and the conduct of the patient, as far as that is known, will serve to guide the diagnosis. The existence of other syphilitic symptoms, primary and secondary, should also be ascertained.

61. viii. FISTULA IN ANO. — *Rectal fistula.*— Fistula is the consequence of *abscess* or *ulceration* of the rectum or anus, and hence it proceeds from the same remote causes — predisposing and exciting — as occasion either or both these lesions. It has usually been divided into *three varieties*, the last of which, however, is very doubtful: — 1st. *Complete fistula*, which has two openings, one in the rectum and the other externally, — 2d. *Incomplete internal*, or *external blind fistula*, which has an opening in the bowel, but none externally. — 3d. *The incomplete external or internal blind fistula*, which has an external opening, but no internal opening into the gut. The existence, however, of this third variety has been disputed with much reason. More than one fistula may exist in the same person, and they may be of the same, or of the first and second varieties. They may present various differences; the fistulous canal may extend far up, before opening into the gut, may have several external openings, may extend far beneath the external skin, may be attended by spasm of the sphincter, and by callosities, hardening, and disease of adjoining parts, as the vagina, bladder, urethra, prostate, or even of the pelvic bones.

62. The constitutional and pathological relations of fistula in ano — the frequent dependence of this lesion upon important visceral disease — have not sufficiently engaged the attention of surgeons in devising their intentions and means of cure. Hence the necessity of close investigation of the *causes* and *complications* of all cases of anal fistula which come under medical or surgical treatment. The *causes* of rectal fistulæ are those already mentioned in connection with the diseases already discussed, but more especially injuries of the internal coats of the rectum by foreign bodies, or by retained matters in the bowel; and the suppuration or ulceration of bunches of hæmorrhoids, perforating or destroying the inner coats of the gut. Fistulæ, from this latter cause, generally form slowly. The patient has itching at the anus, and a knobby swelling forms near the anus, which often merely empties itself by a small opening, or which has little disposition to break externally, but rather spreads upwards, or it may be connected above, with a second opening into the rectum. In some cases the fistula is a consequence of injury, or of the burrowing of pus from some adjoining part, depriving the exterior parietes of the rectum more or less completely of their cellular connections. These fistulæ are often critical — or rather the abscesses in which they originate. But more frequently the fistulæ accompanying constitutional disease, especially *phthisis*, originate in ulceration, frequently affecting the mucous follicles, in the manner already mentioned (§ 56.).

63. According to the researches of SABATIER, LARREY, RIBES, and CHELIUS, the internal opening of rectal fistula is most commonly immediately above the part where the internal membrane of the rectum joins the external skin, and rarely higher than five or six lines above this part. Such appeared to have been the result in seventy-five cases examined by M. RIBES. The condition of the fistula is partly shown by the nature of its origin and history of the case; by the circumstances of the discharge being either purulent or fæcal, and by the passage of intestinal gas through it, especially after having been examined by the probe.

64. ix. TREATMENT OF ABSCESS, ULCERATION, AND FISTULÆ OF THE RECTUM AND ANUS. — The causes and the constitutional relations of these lesions should determine the indications and means of cure that ought to be adopted. If either lesion proceed from constitutional or general disease, the treatment should be chiefly constitutional and dietetic. If either have arisen from acute or subacute proctitis, the means already mentioned as appropriate for chronic proctitis (§ 38.) may be employed; but these should be varied with the diathesis, the complications, the duration or the obstinacy of the disease, and the habit of body of the patient.

65. *A.* When the *abscess* is of a sthenic character, is apparently only forming, then leeches, and soothing applications may be employed; but in all cases, whether sthenic, asthenic, carbuncular, spreading or burrowing, they ought to be opened as early as matter is formed, and a free external outlet to it be afforded. Afterwards, as well as when *ulceration* of the internal coats of the rectum are ascertained upon examination, the treatment, both local and general, should depend entirely upon the features and pathological associations of the case. If the abscess or ulceration has not advanced to the formation of either an incomplete or complete fistula, such means as are most likely to promote the circulation through the portal vessels, and remove obstructions from the liver, ought to be adopted, aided by soothing, stimulating, or as-

tringent and tonic means, locally or constitutionally, according to the peculiarities of the case. With these views, I have given Plummer's pill with soap and inspissated ox-gall; or the precipitated sulphur, with the bitartrate of potash, the confection of senna, and confection of black-pepper, or with capsicum, according to the state of the case. If the rectum continue irritable, or if the ulceration be attended by spasm of the sphincter, emollient injections, the local application of the extract of belladonna, with either of the ointments advised for anal fissure, and a recourse to the decoction of the yarrow, or millefolium, which was recommended to my attention by Mr. Perkins, of Mortimer Street, will afford relief. If the ulceration be obstinate, small injections of a solution of nitrate of silver, or of mucilaginous mixtures containing spirits of turpentine, or the balsams, especially the Peruvian balsam; or pills with ipecacuanha, capsicum, ox-gall, and one of the balsams, will generally remove the disease, if the evacuations and the diet be duly regulated, and if the constitutional powers be duly preserved or increased.

66. *B.* If the ulceration present a foul, spreading, *asthenic*, or gangrenous character, the treatment both local and general should be of an antiseptic and tonic nature. Applications containing one of the chlorides, or creasote, or spirits of turpentine, or the Peruvian balsam; small injections with these; and the internal use of the decoction of cinchona with alkaline carbonates, camphor, serpentaria, capsicum, aromatics, &c. are indicated in these cases. When the ulceration is considered *syphilitic*, then mercurials, especially the bichloride, in gradually increased doses, or calomel, blue-pill, hydrargyrum cum creta, &c. may be prescribed according to the peculiarities of the case.

67. *C. Rectal* or *anal fistulæ* require the adoption of similar principles and means to those espoused above. These fistulæ often require an operation for their cure; but such operations ought not to be undertaken inconsiderately for the following reasons: — 1st. The fistula may be symptomatic of disease of the lungs or liver — of the lungs especially, and the discharge from it may have a beneficial influence on the pulmonary malady. No attempts, therefore, should be made to close this safety-valve of the frame in these circumstances, until another has been established in some other quarter; besides, an operation in these cases is often followed by a recurrence of the fistula. — 2d. Fistulæ may occur in weak, irritable, nervous, and susceptible persons, even independently of tubercular formations, or of pulmonary disease; and yet an operation by *incision* or *ligature* may be followed by very painful or even dangerous consequences. The accidents which may thus occur are, severe or fatal hæmorrhage, inflammation, copious suppuration, colic, diarrhœa, peritonitis, retention of urine, constipation, erysipelas, &c. Although these ill effects of the operation are most common in persons constituted as above, yet they may appear also in the plethoric, the cachectic, and even in those apparently the least likely to be thus endangered. — 3d. Fistulæ, in favourable circumstances, especially during the adoption of means to improve the general health, of a suitable and regular diet, and of a treatment identical with, or similar to, that just advised (§§ 65, 66.), will heal up favourably, particularly when no visceral disease remains to perpetuate the symptomatic lesion. In all cases, the visceral disease should be investigated, and the treatment in great measure directed to it.

68. As to the performance of these operations I need only refer the reader to the able writings of A. Cooper, Brodie, W. Fergusson, Chelius, South, and others referred to in the Bibliography. But I may here add that they should not be attempted when the patient is the subject of any form of pulmonary or tubercular disease; or whenever the fistula becomes a vicariously secreting organ, by which other ailments are alleviated or removed; or if it be connected with disease of the pelvic bones, or of the prostate gland, or with incurable disease of the liver. In many of such cases, the patient may be relieved by enlarging the external opening of the fistula, and by strict cleanliness. The operation, moreover, will often fail in very old fistulæ, in those which have several openings, or which are connected with callosities or ruptures, or when the internal opening is out of reach. Even when no visceral disease exists, if the fistula have been of long standing, the operation should not be undertaken until an issue or seton has been prescribed.

69. V. Fissure of the Anus, Spasm of the Sphincter Ani, and Neuralgic Pain of the Rectum are more or less connected with each other. I very much doubt the existence of *spasm of the sphincter* independently of either *fissure* or *ulceration* within the verge of the anus; and the *pain*, which is often extremely acute in the rectum, especially after a stool, is generally dependent upon one or other, or upon both, these lesions, and is but rarely of a purely *neuralgic* or even *rheumatic* or *gouty* nature. Indeed the pain cannot be viewed as possessing those characters unless it be independent of spasm, fissure, and ulceration, and alternate, as the case may be, with neuralgia, rheumatism, or gout, in other parts.

70. i. Fissures of the Anus — *anal fissures* — have been well described by Boyer, Dupuytren, and Brodie. — *A. Causes.* — Adults are exclusively subject to this disease. Children and young persons are exempt from it; and it is met with in persons between the ages of 25 and 60; most frequently from 30 to 45. It occurs in both sexes, but more frequently in females than males, and in those of nervous, hysterical, and irritable temperaments. The most common *exciting causes* are constipation and the irritation and spasm thereby sometimes produced. The passage of hard substances which abrade the mucous surface in the situation of the sphincter; injuries occasioned by the administration of clysters; the existence of hæmorrhoids or hæmorrhoidal tumours, and previous operations for these, and the venereal poison flowing from the female genitals and infecting the anus.

71. *B. Symptoms.* — The disease sometimes commences insensibly, in certain cases more rapidly or suddenly. The passage of stools is attended by heat and smarting, and, as the fissure increases, by violent pain, and a sense of spasmodic constriction at the anus. The pain often continues for hours after passing a stool; and in the worst cases it scarcely ceases. It is often increased by coughing, by micturition, or by exertion. It is generally lancinating or burning, and is attended

by restlessness, an anxious expression of countenance, increased nervous susceptibility, and loss of flesh and strength. M. Dupuytren states that the disease consists in a lengthy and superficial ulceration in the folds of the mucous membrane of the anus. On separating the orifice and directing the patient to strain, a narrow cleft is observed, with its bottom red, and its edges slightly swollen and callous. It often extends into the rectum; and is more frequently seen at the sides and back of the anus than at its fore part. It rarely extends through the whole thickness of the mucous coat. The most distressing part of the affection is the painful spasm of the sphincter. Sir B. Brodie remarks, that the construction of the sphincter at first appears merely spasmodic; but in proportion as this muscle is called into action it increases in bulk; and after the affection has continued for some time it becomes considerably larger. Dupuytren and other surgeons consider the fissure or ulceration to be produced by the spasm; but, without denying that the spasm may occasion ulceration, I believe — and I state this from the history of several cases, two of which occurred as early in my practice as 1825 — that the fissure or ulceration is commonly the cause of the spasm. The constriction of the anus is often so great as to render the introduction of any body, even the pipe of a syringe, both difficult and most painful.

72. Fissures present various differences according to their situation. When they are entirely *anal*, or are *below* the sphincter, and are external to the verge of the anus, they are much less painful; and the pains are not materially aggravated by the passage of fæces; but there is more or less pruritus; and in this situation the affection is often venereal, especially in females. Fissures may exist *above* or *within* the grasp of the sphincter, or in both situations, extending from the one to the other. When the fissure is above the sphincter it possesses more of the characters of an ulcer. It may be detected there either by means of the speculum or by introducing the finger, to which it feels hard, knotty, or rough; and it is very painful when pressed on by the finger, or when a hardened motion is passed; but the pain ceases soon after, and never continues so long and so violently as when the fissure is grasped by the sphincter. When a consistent stool is passed, the portion of the fæces which passes over the ulcer or fissure is often covered by a puriform mucus, sometimes coloured with a little blood. When the ulcer exists above the sphincter, it does not present the appearance of a fissure, and is not usually attended by spasm; nor by remarkable pain until a motion is passed; but possesses the characters, and, by extending, produces the results, already mentioned, especially copious hæmorrhages, abscess, fistula, &c.

73. *C. Treatment.* — Previously to 1825 this affection was generally treated by the operation first recommended by Boyer. At the commencement of that year I was called to a gentleman residing at Wisbeach who was advised by his surgeon to have this operation performed, conformably with the opinion then entertained by the most eminent authorities. He had been long subject to hæmorrhoids, was remarkably nervous and timid, and had the greatest aversion, notwithstanding the violence of his pains, to undergo an operation. He came to London, and placed himself under my care, having heard that I had expressed the opinion, that this affection may often be completely removed without any operation. Notwithstanding the severity and long duration of the case, I believed that it might be removed by medical treatment merely; and prescribed a light and antiphlogistic diet; demulcents with liquor ammoniæ acetatis; gentle and cooling laxatives; emollient enemata; and an ointment containing one part in seven of the extract of belladonna, which was applied after each stool, and with which the pipe of the enema syringe was directed to be covered when an enema was administered. Within three weeks he returned home quite well, and never had a return of the disease. In the summer of the same year (1825) I attended a lady residing near Russell Square for the same affection, and for which the same treatment was adopted with the like result. Since then I have not treated more than three cases, but these recovered without an operation, the means having been varied according to the peculiarities of each.

74. M. Dupuytren remarks, that fissures *below* and *above* the sphincter most commonly heal without an operation; the former with linen or lint spread with simple cerate, opiate cerate, poplar ointment, mercurial preparations; and the latter by soothing and narcotic lotions of decoction of marsh-mallow, poppy-heads, nightshade, henbane, stramonium, &c. thrown up into the rectum. He says that spasmodic constriction is the true ailment, and that the fissure or crack is merely a secondary symptom. This, however, by no means agrees with my observation. The application of belladonna, when judiciously prescribed and aided by a proper general treatment, is commonly most successful in these cases. One part of the extract may be added to seven or eight of a suitable ointment, or the lead ointment or cerate; or one part by weight of the extract, and one part of the acetate of lead, to six parts of any ointment; and this pomade may be applied once or twice daily, or on the surface of a bougie. In cases where a lotion may be preferred to greasy applications, I have found a saturated solution of the bi-borate of soda, with the extract of belladonna, or vinum opii, used as a lotion, almost as efficacious as the foregoing; or a lotion with the diacetate of lead and an anodyne, for the more external fissures. Sir B. Brodie states that, though he formerly used a *suppository* with extract of belladonna with manifest advantage, yet he is not in the habit of frequently employing it. "Even used in the form of a suppository, the belladonna sometimes produces very serious symptoms by its influence on the brain." He therefore only gives purgative medicine to prevent hard stools, directs the introduction of a bougie before going to the water-closet, and prescribes an opium suppository at night. But the employment of belladonna in the form of a suppository is not required, and is always objectionable; and much of the success depends upon the selection of laxatives, rather than purgatives, or upon the means by which the bowels may be kept gently open, and the irritation in the rectum and anus at the same time soothed — intentions which the experienced physician will readily fulfil.

75. ii. Neuralgic, Rheumatic, or Gouty Pains of the Rectum or Anus are rare, and cannot be admitted to exist, unless they appear connected with neuralgia, rheumatism, or gout in some other part, either before or after the pain had

been felt in the rectum. Pains in the gut or in the anus are generally caused by ulceration, or fissure, or spasm of the sphincter, the existence of either of which should be ascertained whenever pains in these situations are experienced; and if they can be referred to either of these causes, the treatment ought to be directed accordingly. If, however, no such source can be detected, or if they are referable to neuralgia, rheumatism, or gout, the means which have been recommended for these maladies should then be prescribed, and aided by narcotic or anodyne suppositories, or ointments, as advised for spasm of the sphincter.

76. VI. PROLAPSE OF THE RECTUM.—*Prolapsus ani.* — *Vorfall des Mastdarmes*, Germ.; — *Chute du Rectum*, Fr.

CLASSIF. — IV. CLASS. I. ORDER (*Author*).

77. Prolapse of the rectum or anus appears under different forms: — it may be *complete*, the prolapsus consisting of all the coats of the bowel, to a greater or less extent; or it may be *incomplete* or partial, and consist only of the inner coats. It may arise from *debility* only, as in children, and in these cases it is generally complete; or from *hæmorrhoidal tumours*; or from *irritation* or *chronic inflammation* of the internal coats; and in these two classes of cases it is generally incomplete or partial, consisting only or chiefly of the mucous and cellular coats. CHELIUS states that this disease appears under *three forms*: — it may be either the rectum with all its membranes, or simply the internal membrane, or an inverted upper portion of the bowel — *volvulus*, or intus-susception of the upper part.

78. i. *Prolapse from debility — prolapse of all the coats of the rectum* — has been doubted by a few surgeons who could have had no experience of the diseases of children, among whom this affection is by no means infrequent. Mr. COPELAND says, that "in almost every case of prolapsus ani, it is the internal membrane of the intestine only which descends through the sphincter." No doubt such is the case in the great majority of cases in adults, especially when the prolapse is consequent upon hæmorrhoids and changes just mentioned; but in children, and even sometimes in old persons, especially females, the prolapse is often that of all the coats, and not infrequently to a very great extent; although in them also partial prolapse, or protrusion of the inner coat only, sometimes occurs. It depends upon imperfect tonic contraction of the sphincter, and relaxation of the connections of the bowel with the surrounding parts. It proceeds from the general debility observed in children reared in unhealthy localities, in the ill-fed, and in the offspring of aged and debilitated parents. In some cases both the sphincter and the muscular coats of the bowel seem more or less paralysed. The tumour is usually of a large size; and if it be allowed to remain for some time unreduced, the coats become congested, livid, and thickened, and much difficulty is experienced in reducing it. Mr. SYME considers that the prolapse, involving the whole parietes of the gut, is owing chiefly to irritation. This may be sometimes the case, especially as irritation is not infrequently associated with debility or want of tone of the parts, especially of the sphincter. The tumour is commonly round or oval, but sometimes cylindrical, varies in size from that of a small egg to that of a large orange, exhibits the slimy surface of a mucous membrane, and affords a secretion similar to red currant jelly. This protrusion is the same as an invagination occurring higher up in the bowels, and differs only in its being so low down as to become external.

79. The *symptoms* of the prolapse vary with the extent of protrusion, and with the habit of body and strength of the patient. They are commonly very severe, and most urgent in young or robust subjects. There are straining and pain at the anus, with obstruction of the fæcal evacuations. If the protrusion continue, the pressure of the sphincter retards the return of blood from the protruded part, which then becomes engorged, livid, and swollen. Inflammation may follow, if the prolapse be not removed; and increased pain, fever, ulceration, sphacelation, or peritonitis, may supervene. Recovery may follow the sphacelation of the protruded part, or death, in consequence of peritoneal inflammation.

80. ii. *Prolapse from hæmorrhoids, or chronic inflammation of the internal coat*, is the most frequent form, and occurs to a much less extent.—(*a.*) When it is consequent upon chronic inflammation, or inflammatory irritation, there is generally more or less thickening, seated chiefly in the connecting cellular tissue. The frequent straining, often preceding and attending this protrusion, causes a relaxation and elongation of the internal coat, especially when hæmorrhoidal tumours complicate the affection. At first a little reddish swelling only appears, which gradually enlarges, becomes wider, is rounded below, but narrowed above by the sphincter; and, at its free extremity, has an opening by which the stools pass. The surface of the protrusion varies in appearance with the degree of constriction exercised by the sphincter, and with the duration of the displacement. It is red, or livid, soft or slightly tense, often divided into several lobes, and covered with bloody mucus. Dr. BUSHE justly states that, when this protrusion occurs in children, it presents the appearance of a small pyramidal, red, and coiled tumour; while in the adult it is less red, and generally takes the form, either of two lateral flaps, or of a circular fold. "In some of these cases, the portion of membrane protruded comes from the pouch of the rectum, while that within the sphincters remain in situ. When this is the case, the extremity of the little finger may be passed between that portion of the membrane which adheres to the internal sphincter and that which is protruded." (p. 204.)

81. (*b.*) Mr. COPELAND observes, that prolapsus ani has so many points of analogy with hæmorrhoids that it may be considered as the same disease in a more chronic and advanced state; and Mr. SYME thinks that the protrusion of the mucous membrane alone should be referred to the head of hæmorrhoids. Dr. BUSHE remarks, as to its *diagnosis* from hæmorrhoidal tumours, that the semilunar form of the flaps, the extent of their base, our ability to glide the folded membrane between the finger and thumb, as well as the absence of erection and hæmorrhage, are sufficient to distinguish this form of protrusion from hæmorrhoidal tumours. He adds, in respect of *intus-susception* of the rectum, that, in cases of *protrusion*, a probe, or the finger cannot pass higher than the border of the internal sphincter, owing to the doubling of the mucous membrane, while in intus-susception no resistance is offered to the passage of either the one or the other.

82. iii. The *prognosis* of prolapsus ani varies with the age and other circumstances of the patient. In *children* it is generally soon cured; or becomes less and less frequent as the child advances in age. In adults and old persons, it is a much more severe and obstinate complaint; and more readily and frequently recurs. In old prolapses considerable changes take place in the rectum and anus. A discharge of mucus is almost constant, the prolapsed mucous membrane becomes indurated, loses its villous surface, and sometimes ulcerates, especially when the sphincter is relaxed, and when the patient is subject to much straining at stool.

83. iv. The *causes* of prolapse of the rectum in *childhood*, amongst whom this complaint is most frequent, are the irritation of teething, or of ascarides in the rectum; diarrhœa occurring during or after weaning; insufficient or unwholesome nourishment; attempts to dispense with a healthy nurse; general or local debility and relaxation of the pelvic viscera; violent screaming and straining at stool, especially when produced by purgatives which irritate the rectum, as calomel, &c.; stone in the bladder; sitting on cold seats, and exposure of the loins to currents of cold air, occasioning a partial paralysis of the muscular coats of the rectum and sphincter.

84. The causes which most commonly produce this malady in *adults* and aged persons, are those which frequently occasion hæmorrhoids, or proctitis (§§ 35. 36.), and whatever weakens the tone of the sphincter ani and the attachments of the rectum to adjoining parts; the improper or frequent use of relaxing enemata or lavements; the neglect of the sub-acute or chronic forms of proctitis, especially when they are attended by much straining at stool; residence in hot and unhealthy climates; the several forms of diarrhœa and dysentery, especially the chronic; thickening, induration, and polypous excrescences of the inner coats of the bowels; hæmorrhoidal tumours, and other organic changes of the parts; stone in the bladder or disease of the prostate gland; prolonged costiveness; intestinal worms; protracted self-pollutions; sudden or violent muscular efforts; previous injuries and operations implicating the rectum or anus; and injuries or diseases affecting the dorsal or lumbar spine.

85. v. *The treatment* of prolapse of the rectum should be regulated according to the *cause*, and the *age*, and other circumstances of the patient. The *first* object is to return the protrusion; the *second* is to prevent the recurrence of the prolapse. — (*a.*) The *first* is generally accomplished with ease when the prolapsus is only partial; but when it is complete, or consists of the whole parietes of the bowel, the reduction of the protruded part is often difficult. But, by pressing up the parts nearest the opening of the bowel first, and directing the pressure upon and in the direction of the opening, much less difficulty will be experienced. If the swollen, reddened, and inflamed state of the prolapsed part, or spasm of the sphincter, or both, prevent the reduction, the application for a short time of a piece of muslin on the tumour wetted with equal parts of tinctura opii and sulphuric æther, and allowing a rapid evaporation so as to produce a quick transfer of heat, I have never known to fail in many cases in which I have advised it in cases of the complaint in children.

86. (*b.*) In order to prevent a return of the complaint, the cause should be investigated, and the remote as well as the more immediate causes removed or counteracted. The numerous surgical writers who have entertained this subject, have advised various operations, which are more or less painful, and not always devoid of risk; and these operations have not always been preceded by a sufficient trial of those medical and rational means, upon the failure of which only they should be resorted to. Partial prolapse, or that form of the complaint which is consequent upon neglected or prolonged hæmorrhoidal affections, is often complicated with chronic inflammation and thickening of the inner coats of the bowel, or with torpor or obstruction of the liver, and obstinate congestion of the hæmorrhoidal vessels; and unless these be removed by appropriate means, the prolapse will return frequently, and at last become almost constant. In these, as well as in several other circumstances of the complaint, PLUMMER's pill, with soap, and taraxacum should be given at bed-time; and the bi-tartrate, tartrate or acetate of potash, in the morning and mid-day, either in a decoction of Achillæa millefolium, or of the taraxacum, or in the compound decoction of scoparium, in doses sufficient to keep the bowels sufficiently open. After these have been taken some time, and if the excretions have then acquired a natural appearance, cold injections into the rectum, each containing about a drachm of the muriated tincture of iron, or two or three drachms of the spirits of turpentine to half a pint or twelve ounces of the vehicle, will generally be of great service. These injections may be repeated according to circumstances; but care should be taken to preserve the secretions and excretions in a healthy and free state.

87. (*c*). In *children* especially, and when the prolapse is complete, the treatment should be more constitutional than local, or the latter ought to be in aid of the former. The means should be directed to the form of general disorder; and tonics, especially those containing the preparations of iron; cold salt-water, or sea-bathing, the douche of salt-water, or weak brine, on the loins, followed by active exercise; the cold medicated injections just mentioned; the muriated tincture of iron taken internally, preserving at the same time the bowels gently open, or at least preventing costiveness; and attention to suitable, light, and nourishing diet, avoiding bulky innutritious vegetables, will rarely fail in preventing a return of the protrusion. If the complaint be associated with intestinal worms, the treatment should be directed accordingly, the injection containing the turpentine, or an occasional draught with a moderate dose of this substance, and an equal quantity of castor oil, will produce a very decided benefit. In the more obstinate, or prolonged cases, after returning the protruded bowel, and adopting the above treatment, the patient should retain the horizontal posture for some time; and after using cold-bathing or the cold douche, he may cover the loins with the emplastrum thuris comp., and have recourse to such means, medicinal and dietetic, as will promote the general health. When the above measures are unavailing, then the operations advised by surgeons may be adopted; for an account of which I must refer the reader to the works referred to in the BIBLIOGRAPHY, especially to those by FERGUSSON,

BRODIE, DUPUYTREN, BUSHE, CHELIUS, and SOUTH.

88. VII. EXCRESCENCES ABOUT THE ANUS AND POLYPI OF THE RECTUM are analogous affections. — *A.* The former sprout from the skin and mucous membrane adjoining the anus; and assume various forms, to which different names, as sycoma, ficus, mariscæ, cristæ, verrucæ, porrus, condyloma, &c., have been given. These excrescences are *caused* by friction, erosion, the irritation produced by morbid secretions and by neglect of personal cleanliness, and by specific poisons. They are prevented by avoiding these causes; and, when fully developed, they are best treated by the local application of strong solutions of iodine, or nitrate of silver, or of hydrochlorate of ammonia, or of bi-chloride of mercury, or other appropriate means. If these are inapplicable or are inefficient, excision or ligature becomes necessary.

89. *B. Polypi* are not infrequent in the rectum, and, like the same formations in other situations, they present either a *mucous* or a *sarcomatous* structure. — *a.* Dr. BUSHE considers the mucous species to be most common; M. SANSON the sarcomatous. M. STOLTZ (*Gazette Médicale de Paris*, 1841, p. 253.) states that they are much more frequent in children than in adults; and that, while they occasion protrusion of the rectum, they are often confounded with that complaint. Their intimate structure has not been exactly ascertained. In children, they present more of a mucous homogeneous structure; whilst in adults they have more of a fleshy or spongy structure. In a case which was removed by my directions, the polypus had a serous-like cavity containing a little clear fluid, the walls being apparently amorphous. I have never observed any possessing a fibrous structure. Polypi of the rectum vary in their size, situation, and insertion. They may vary from the size of a pea to that of an egg: they may have a very broad, or a very narrow base or pedicle. They may be seated near the verge of the anus, or high in the rectum. These surfaces also vary; but they have generally the mucous aspect, a pale reddish hue, are rounded or oval, and are either smooth or equal, or more rarely lobulated. The mucous membrane appears thickened at or around the point of insertion. More than one may exist in the same case.

90. *b.* The *symptoms* produced by rectal polypi are different according to their seat and size. If low down, the polypus will protrude with fæcal evacuations, or even remain protruded. It may be the cause of partial prolapse of the gut, and it may be mistaken for prolapse, whether occurring independently of, or complicated with, that complaint. When high in the rectum, it may not be recognised until an examination be made. When it is near the verge of the anus, it soon becomes external, and continues in this state. In rare instances the bowel and sphincter contract so forcibly as to strangulate and detach it. When it is seated high in the bowel, it may not be readily distinguished from an invagination, although, in this latter, the aperture of the invaginated part may be felt, if the displacement be within reach. The polypus rarely advances to a considerable size without causing costiveness, and colicky pains in the course of the colon, with tenesmus. The straining is often distressing, but is attended by much less pain than when it is caused by inflammation. The evacuations, when soft, are contracted, flattened, and generally smeared with mucus and blood, or pus, so as to lead to the supposition of stricture of the rectum; an examination, however, readily determining this point. When the polypus increases in size and malignancy, the patient becomes sallow, and loses his appetite; his tongue is coated, and his thirst constant. Emaciation, œdema of the lower extremities, and hectic fever supervene. Fæcal evacuations are procured with difficulty, are scanty, and commonly not without the aid of clysters. Tenesmus and weight in the rectum increase, and are attended by lancinating pains. There is much muco-purulent discharge, and often considerable hæmorrhage. If blood exudes from the surface of the polypus, and if it cannot be readily distinguished, on examination, from an invaginated portion of intestine, the diagnosis between them becomes difficult; but the symptoms of the latter are much more acute, and fæcal obstruction much more complete, than those of the former, whilst polypus in the rectum is a much more protracted malady.

91. *c.* The *treatment* of rectal and anal polypi is the same as that usually adopted for polypi in other situations. Surgeons are divided in opinion as to the propriety of removing them by excision or by ligature: much may depend upon their seats and attachments; and probably, in the majority of instances, they should be removed by both — by ligature and excision just below the ligature; but let the surgeons decide this point.

92. VIII. CONTRACTION OF THE ANUS. — (*a.*) This lesion is seldom observed; but it has occurred owing to the following local changes: — 1st. By the contractions of a cicatrix either just within, or just without, or implicating the verge of the anus; — 2d. By the deposition of lymph, which has become more or less organised in the submucous cellular tissue, thereby forming a ring around the anus; — 3d. By the production of lymph on the mucous surface of the lower portion of the rectum, which becomes somewhat organised, either forming filamentous bands, or narrowing the outlet both by its thickness, and subsequently by the contraction to which, like other false membranes, it is liable; — 4th. By the various changes consequent upon chronic inflammation of the internal membranes, or of hæmorrhoidal tumours, or of veins, especially irregular thickening, induration, and cartilaginous transformation. These changes nearly approach one of those next to be noticed, and differ from it only in implicating the anus, more or less, instead of being seated in the rectum entirely. The *symptoms* of this alteration are those of permanent stricture of the rectum, the nature and seat of lesion being readily ascertained by an examination.

93. (*b.*) The *treatment* should be adapted to the change occasioning the contraction; but in every circumstance the bowels ought to be kept gently open, inflammatory action should be subdued, and tumours, hæmorrhoids, or other associated lesions removed. Mechanical dilatation should be cautiously adopted, after these preliminaries have been effected.

94. IX. STRICTURES OF THE RECTUM. — The rec-

tum is subject to two kinds of obstruction affecting its parietes, and narrowing its canal, — the one is *spasmodic*, and occasional; the other is *organic*, and permanent until removed by treatment.—*A.* Mr. MAYO remarks, as to the part of the rectum which is the seat of *spasmodic stricture*, that no single point is more liable to this affection than another. The cases which he has met with have impressed him that the upper part of the rectum and the sigmoid flexure of the colon are most liable to irregular contractions of their muscular tunics. —(*a.*) This complaint, especially when seated thus high in the bowel, is independent of fissures or ulcers in or near the anus; these lesions, however, frequently produce spasms of the sphincter and lower portion of the rectum, which are most severe or painful during and after the passage of a stool. Spasmodic stricture occurring thus independently of fissure or ulceration near the anus, is most common in debilitated constitutions, and in nervous and irritable temperaments, and as a sequela of dysentery. It is apparently *excited* by the vitiated state of the biliary and intestinal secretions and excretions. The frequent or habitual recourse to purgatives, especially to those which excite or irritate the lower bowels, cannot fail of predisposing to this form of stricture, when it does not produce chronic inflammation or hæmorrhoids.

95. (*b.*) The *treatment* of spasmodic stricture of the rectum ought to be chiefly dietetic and regimenal. The biliary and intestinal secretions and excretions, with the several digestive functions, should be improved and promoted by means suited to the existing disorder; and the lodgment of vitiated secretions and fæcal matters prevented by means of emollient, anodyne, and antispasmodic clysters. I have found these, and pills consisting of ipecacuanha, Castile soap, inspissated ox-gall, and sometimes also the extract of henbane, or of hop, taken twice or thrice daily, with due attention to diet, and regular exercise in the open air, remove the disorder in a few days or weeks.

96. *B. Organic or permanent stricture of the rectum* results from chronic inflammation, which, however, may have been associated, at one time or other, with additional lesions.—*a.* It consists of a partial thickening of the sub-mucous coat of the bowel and of the connecting or adjacent cellular tissue; through which means a smooth ring is formed, generally from a third to half an inch, more rarely to an inch in depth, which projects into and narrows the canal. Sometimes the thickening does not include the whole circle of the intestine, but a segment only. The ordinary seat of organic stricture is from two and a half to four inches from the orifice of the gut. But sometimes it occurs higher in the bowel—at six or seven inches from the anus; and a contraction of the same nature is occasionally also met with in different parts of the colon. (MAYO.)

97. *b.* The *symptoms* of stricture of the rectum generally come on slowly, unless the complaint follow acute or sub-acute proctitis. In other circumstances, or when it is, as most frequently, the consequence of chronic irritation or inflammation, the more urgent symptoms are slowly and gradually increased; and the obstruction is often very considerable before the patient has recourse to medical advice. There is always a sense of obstruction and weight in the lower bowel, which are not relieved effectually by attempts at evacuation; uneasiness, distention, and occasional spasmodic or colicky pain in the abdomen; pain in the sacral region, often advancing to the loins and extending down the limbs; itching and heat about the anus; frequent eructations and flatulent distention, with oppression at the præcordia; bearing down in females, and nervous irritability; headache, and dejection of spirits; and a vitiated state of the alvine secretions and excretions. When the disease has continued for some time, the hæmorrhoidal vessels often become congested, and tumours form near the anus, produced by extravasated blood, which in old cases occasion thickening and elongation of the skin about the anus. Owing to the local irritation and determination of blood, inflammation, passing on to suppuration, sometimes attacks the cellular tissue near the anus, forming abscesses, terminating in fistulæ. (BUSHE.)

98. The calls to stool are sudden, inefficient, and often amount to six, eight, or twelve in the twenty-four hours—generally two, three or more taking place within a very short time. They are attended by much straining, which sometimes, if the stricture is high in the gut, gives rise to protrusion of the mucous membrane. Much flatus, and a small quantity of mucus, occasionally mixed with blood, are often all that is evacuated; but every two or three days fæcal matter, in small pellets of hard; and in long, round, angular, or flattened portions, of small diameter, if soft, is discharged. After each attempt, although the pain is very moderate, a sensation continues as if the bowels had not been emptied; and this being actually the case, several successive attempts, with only slight effect, are usually made in quick succession. When a sufficient quantity of fæculent matter and mucus is evacuated to afford some relief, the patient desists with fatigue, until a sense of fulness, weight, and tenesmus requires another effort. Occasionally the accumulation of fæces above the stricture, by irritating the mucous surface, causes an increased secretion from this surface; and the fæces, being thereby rendered more fluid, pass more readily through the stricture; and the accumulation is thereby either partially or altogether removed. If the stricture be not very high in the rectum, it may be reached by the finger, especially if the patient strains during the examination; but if it cannot be reached, the bowel should be sounded by the instrument recommended by Sir C. BELL, which consists of an ivory ball, mounted on a stalk of whalebone.

99. In some instances, many years may elapse without the patient's general health being materially impaired, notwithstanding the fæcal retention and daily sufferings. Ultimately, however, he loses his appetite, and becomes pale, emaciated, and hectic. At last purulent matter, so acrid as to excoriate the anus, is discharged in great abundance, and frequently it comes away when he coughs or stands erect. These symptoms increase until life is exhausted. (BUSHE.)—Some patients die before the disease arrives at this stage, owing to the obstruction and fæcal accumulation: they become distended with flatus; breathe with difficulty; are distressed by singultus, and all the symptoms of ileus. The pulse is very frequent, small, irregular, or intermittent; the extremities

are cold, are seized with cramps; and ultimately the features, which were previously anxious, are collapsed, and cold perspiration, restlessness, &c., usher in dissolution.

100. Dr. BUSHE remarks that, in a few cases, the stricture is partially destroyed by ulceration; but the portion of rectum immediately above it is more frequently thus affected. In these the intestine may communicate, by means of adhesion and ulceration, with the bladder in the male, and with the vagina in the female, thus forming a recto-vesical or recto-vaginal fistula, through which the fæces may pass. A much more common consequence, however, of the ulceration, especially when the ulceration is low in the gut, is the passage of fæcal matters into the cellular tissue, forming stercoraceous abscess, passing into fistulæ, which may vary in number from one to a dozen, especially in females. The ulceration may, also, after causing adhesions to another portion of bowel, open into it; or, failing of producing adhesions, open into the peritoneal cavity, and rapidly terminate by occasioning general peritonitis.

101. *c.* The *diagnosis* of organic stricture of the rectum is not without importance; for lesions of adjoining parts, as well as other lesions of the gut, may be confounded with stricture. —(*a.*) *Retroversion*, or *enlargement of the uterus;* disease of the *prostate gland;* and *tumours* in the vicinity of the rectum, may simulate stricture by pressing upon and obstructing the canal of the viscus, by rendering defæcation difficult, causing figured stools, tenesmus, mucous discharge, and fulness or weight in the sacral and perineal regions. In these, an examination will disclose the nature of the complaint; and not the less readily, when painful chronic affections of the vagina occasion symptoms resembling stricture of the rectum, owing to the contiguity of situation and nervous communication. —(*b.*) *Ulceration* of the rectum, or *fissure* of the anus, with *spasm* of the sphincter, can hardly be mistaken for stricture, if the state of the stools, and the remarkable pain attending the discharge of them, receive due attention; but these lesions may co-exist with stricture, and then a careful examination can alone determine the presence of the complication. —(*c.*) Stricture of the rectum may be mistaken for a *sarcomatous tumour* growing into the bowel, owing to the pressure of the stricture downwards by the fæces accumulated above it. A careful examination per anum will generally lead to the detection of an opening admitting the point of the finger, and demonstrating the nature of the lesion. —(*d.*) The *malignant affections* of the rectum will be distinguished from the organic stricture now being considered, by the sallow or leaden and cachectic hue of the countenance and surface; by the lancinating paroxysmal pains, and the rapidity of the ulcerative process.

102. *d.* The *causes* of stricture of the rectum are very frequently only those which have been enumerated in connection with *proctitis* (§§ 35, 36.), especially when these causes have been in frequent or prolonged operation. The complaint is very rarely observed before the adult age, or after the 60th year; and it is nearly equally frequent in both sexes. Mr. COPELAND thinks that women are oftener affected than men. Dr. BUSHE treated eight cases in females and seven in males. Stricture is obviously the consequence of previous disease — of chronic dysentery, diarrhœa, &c., — of slow inflammatory action, or of the frequently repeated irritation of purgatives on the lower bowels. In some cases, the cause can hardly be determined.

103. *e.* The *treatment* of organic stricture of the rectum is chiefly surgical — consisting in great measure of mechanical dilatation. I cannot, however, see wherefore a lesion commencing so frequently in chronic inflammation, consisting principally in thickening of the connecting cellular tissue from the deposition of coagulable lymph, and passing into ulceration, should be so entirely or even chiefly treated by mechanical means. Much certainly depends upon the amount of change existing in the bowel; but the effects obtained from these means are not always satisfactory; and, if due discretion as to their adoption, and caution in their employment be not exercised, increased pain and irritation, general distress with shiverings, sickness at stomach, colicky pains, and even peritonitis, may follow a recourse to them. In many instances, where bougies have been injuriously employed, the application of leeches to the anus, and mild laxatives and anodynes, would have afforded more or less relief; for I have no doubt that the constant state of emptiness in which the lower bowels are kept by purgatives, mercurials, and injections, in the usual treatment of those affections so generally ascribed to stricture, and the irritation produced by bougies are no mean agents in actually producing or aggravating the complaint which they are intended to remedy. The nimia diligentia is commonly too conspicuous, with whatever intention it may be dictated. There can be no question as to the impropriety of preventing the lower bowels from experiencing that state of healthy distention necessary to antagonise the contractions of their circular fibres. All hollow canals contract inordinately, even to the extent of obliteration, when they are deprived of the natural antagonism produced by their contents. I have generally found, that persons who were subject to stricture of the rectum, had been, for a long period previously, in the habit of taking purgatives, which kept the lower bowels almost constantly in an empty and irritated state. At an early stage of the complaint, more benefit will arise from the use of such means as will remove inflammatory irritation, and allow the fæces to become the natural and daily dilator of the incipient constriction, than from those measures which are commonly recommended, and often too officiously employed. Nevertheless those measures are frequently requisite, and are often successful in experienced and cautious hands.

104. In early stages of the complaint, after prescribing the treatment advised for the chronic states of proctitis (§ 38.), an evacuation from the bowels should be obtained every day, or every other day, by mild aperients taken by the mouth, or by enemata. The laxatives which I have preferred in these cases have been castor oil, olive oil, manna, magnesia with sulphur, the confection of senna, the bitartrate of potash with bi-borate of soda, or the compound infusions of senna and gentian. The injections should not be too frequently administered unless the obstruction be such as to occasion dangerous fæcal accumulation above the stricture, and they ought to

consist chiefly of emollients and laxatives, as soap with olive oil, the bi-borate of soda in the decoction of marsh-mallows, and similar relaxing and soothing substances.

105. When it is determined upon to have recourse to instruments for the removal of contraction of the rectum, the fact should not be overlooked, that these contractions generally result from chronic inflammation, and that the change thus produced, unless it has gone on to fibro-cartilaginous induration, disposes the part to laceration when even a slight dilating force is used; the sound adjoining parts readily yielding, whilst the contracted parts are as readily torn. Nor should it be forgotten that there is an intimate consent between the mucous canals of the pelvis and the peritoneum, injury of the former, especially mechanical injury, not infrequently exciting peritonitis, although the violence is sustained at a part of those canals which are not covered by peritoneum. A recourse, therefore, to bougies and other mechanical means of dilatation should be had with caution. As to this topic, and as to recourse to division of the stricture, I must refer the reader to the surgical authorities contained in the *Bibliography*.

106. X. INVAGINATION OF A PORTION OF THE UPPER PART OF THE RECTUM, WITH OR WITHOUT CONTRACTION, occurs in rare instances.—*a*. When stricture takes place at, or near to the junction of the rectum and sigmoid flexure of the colon, the pressure above may carry the obstructed part down into the relaxed and dilated portion below, and thus produce either an incomplete, or a complete invagination, although the stricture of the invaginated part be very slight. When the rectum is much dilated, or is in that relaxed or paralysed state described above (§§ 12. *et seq.*), the upper part, or a portion of the sigmoid flexure of the colon, or both, may thus be forced downwards, or invaginated, even although no actual stricture of these parts exists. This state of disease has been noticed by Mr. CHEVALIER, Mr. EARLE, and Mr. MAYO. The last of these writers remarks, "that it originates in great laxity and dilatation, which is liable to be produced by frequent large accumulations of fæcal matters in the rectum." When the bowel is in this condition, the upper part of it is liable to be invaginated, or to form a prolapsus within the lower. The prolapsed part, whether consisting merely of a fold of the internal membranes, or of the whole parietes of the bowel, soon becomes inflamed, thickened or indurated, and the opening through it contracted; so that the symptoms and distress are thereby greatly aggravated.

107. *b*. The *symptoms* of this lesion are often ambiguous. But imperfect action of the bowels, frequent and ineffectual efforts to void the fæces, discharges of puriform mucus, and aching pain, weight, and tenesmus in the sacral region, are most commonly complained of. As there is generally a capacious sac below the invaginated or contracted part, fæces may accumulate there, the watery portion being absorbed, and the fæcal part thereby rendered more consistent. The stools may thus be discharged nearly of their natural quantity and appearance, and the nature of the complaint may hence not be ascertained, unless an examination by the finger or speculum be properly made.

108. *c*. The *treatment* consists of the exhibition of gently aperient medicines; or rather of the combination of tonics with aperients, as of the compound infusions of gentian and senna; or of rhubarb and inspissated ox-gall; and of oleaginous enemata. In this, as well as in other affections of the rectum, the decoction of *Achillæa millefolium* may be taken as follows, and may even be administered as an enema, omitting the tinctures and salts: —

No. 330. ℞ Achilleæ millefolii, ℥ij; Aquæ, ℥xxiv. Coque per partem horæ quartam, et cola. Liquori colati adde Bitart. Potassæ, ʒiij; Sodæ Bi-borates, ʒj; Tinct. Aurantii et Tinct. Cardamom. co. āā, ℥ss. *M.* Fiat Mist.: cujus capiat coch. iij. vel iv. ampla, bis terve in die.

Subsequently astringent injections, especially those with the terebinthinates or balsams, may be prescribed; and such mechanical means as the case may require be resorted to, more especially properly adapted bougies or tubes.

109. XI. CANCER OF THE RECTUM. — *Scirrho-contracted rectum. — Carcinoma of the rectum.* — *A. Malignant disease* may attack the rectum only, or both it and the anus, or it may commence in or affect chiefly the anus. Dr. BUSHE states, that it presents chiefly the cartilaginous, lardaceous, and encephaloid forms. The cartilaginous degeneration may commence either as hard tubercle on the mucous coat, or in the muscular tunics of the bowel, this latter being the most common. The muscular fibres become pale and firm, and the connecting cellular tissue undergoes a similar process of condensation, without alteration of colour. As the morbid process goes on, this tissue often becomes lardaceous; and the walls of the bowel increase in thickness, and the cellular and muscular coats are sooner or later softened and confounded each with the other. Sometimes the mucous tunic is studded with lardaceous and encephaloid vegetations, while the serous coat presents cartilaginous tubercles. The lardaceous degeneration is thus superadded to the cartilaginous, but the one may occur without the other; and the muscular and cellular coats may be lardaceous, while the mucous tunic throws out encephaloid growths. The encephaloid degeneration is sometimes primary, commencing in the cellular tissue or mucous coat, but more commonly it is consequent upon the cartilaginous or lardaceous.

110. Any portion of the rectum may be first attacked, but the junction of the rectum with the sigmoid flexure of the colon, that immediately above the pouch, and the anus, are the parts most commonly affected. Adjoining organs are also frequently involved in the disease, especially the recto-vaginal septum, the os and cervix uteri, and the urinary bladder. The malady, instead of being seated in the rectum, may attack the colon, either in or near the sigmoid flexure, or considerably above that part, or in some other portion of the bowel. It may even co-exist in the rectum with malignant disease in some other situation, as in the stomach or pylorus. The physical changes in the parts are, according to Mr. MAYO, contraction, a peculiar induration of the parietes of the bowel, thickening, and ulceration of the mucous surface. The induration results from the scirrhous degeneration of the muscular and cellular coats, the diseased parts assuming different appearances, according to the quantity and character of the morbid formation. In one variety, "the thickening is inconsiderable, but the mucous

membrane is abraded, the muscular coat is hard, firm, gristly, and the canal of the bowel is narrowed. The muscular fibre is partly converted into, partly contained in, firm, gristly, fibrous substance." This form of the disease does not generally extend to the anus, but commonly begins from one inch to one inch and a half within this part, and occupies from four to five inches of the bowel, terminating abruptly upwards, and more gradually towards the anus. Another or fungoid variety is characterised by considerable thickening, caused by a greater amount of scirrhous deposit than in the preceding. The scirrhous stricture is grey, fibrous, not quite opaque, much looser, and more succulent and lardaceous or fungous in parts, than in the former kind. Fungoid cancer, at its commencement, generally occupies a portion only of the circumference of the bowel, and is felt as a hard tumour situated about three inches within the gut, and commonly upon its anterior surface, with the mucous membrane as yet unbroken. The morbid growth extends in each direction, upwards to the flexure of the colon, and downwards so as to implicate the anus, and to throw the anal integument into hard knots. This form of the disease is that which is most frequently found in parts of the large intestines above the rectum. In either form, the adipose tissue external to the rectum becomes firmer and more crisp, as seen in the same tissue around a cancerous mamma.

111. According to the view of this malady taken by M. CRUVEILHIER, cancer may commence in any part of the rectum, and may assume any form of the cancerous degeneration, from the scirrhous induration to the soft medullary fungus, or encephaloid, or any, or even every form, may be blended in the same case. In women, among whom it is most frequently seen, it is often a mere extension of cancer of the uterus, or rather of the vagina, the disease affecting the recto-vaginal septum in such a manner as to render it difficult to determine in which canal it had commenced. It very rarely thus appears to commence simultaneously in the rectum and urinary bladder in men. M. CRUVEILHIER thinks that cancer of the rectum is mostly a local disease; but this is the case only at its commencement, or at an early stage, before the cancerous contamination of the blood and frame generally has taken place.

112. *B. Symptoms.*—Malignant stricture of the rectum is more frequently met with than the simple thickening and induration already noticed (§§ 96. *et seq.*). Whatever may be its particular characters,—whether scirrhous, sarcomatous, lardaceous, fungoid, or encephaloid,—it encroaches upon and narrows the canal of the rectum, so as more or less to obstruct fæcal evacuation, and occasion great and constant distress. The patient complains of a dull, fixed, or aching pain at the upper part of the sacrum, with severe shootings, or sharp exacerbations, extending down the limbs, with violent tenesmus, and a sense of weight or bearing down in the part, especially after evacuations, or whatever may cause irritation of the part. Bloody purulent matter, or a puriform sanies, is passed with the stools, which are thin and frequent. In the fungoid variety, discharges of blood may be large and often. Mr. SYME remarks, that though in the early stage difficulty may be experienced in passing the fæces, owing to the thickening of the coats of the gut, yet there is for the most part ultimately rather an inability of retention, from the action of the sphincter being impeded by the progress of the disease.

113. At an advanced stage, the countenance and general surface display more or less of the appearance of malignant cachexia, or a sallow, leaden, or greenish-yellow hue; and flesh and strength are lost; the blood also becoming deficient. On examination per anum, the bowel is found contracted, thickened, and irregular on the surface. The affected parietes are hard and unyielding, and morbid growths are felt projecting into the cavity; in some places in the form of rounded tubercles, in others with rough or ulcerated depressions. These changes may not feel very different to the touch from those which attend simple stricture, excepting in their greater degree; and hence more reliance is to be placed upon the symptoms indicative of malignancy, than upon the sensations furnished by the examination. The acute, lancinating, and paroxysmal pains, extending to the loins, pubis, and thighs; the sense of weight, aching, and numbness in the sacrum, loins, hips, &c.; the aggravation of these upon standing or walking; the irritability of the bladder, or incontinence or retention of urine; the more frequent and larger discharges of blood than in simple stricture; the bearing down sensation, especially in females; and the general cachexia and anæmia, as the disease advances, sufficiently indicate the malignant nature of the malady. Ultimately hectic, exhaustion, abdominal tenderness, hiccup, vomiting, &c., usher in dissolution.

114. *C. Causes.*—This disease may occur at almost every age. Mr. MAYO has seen it as early as twelve years of age. It is most frequently met with between the ages of thirty and sixty. The encephaloid is the variety which is met with early in life; the scirrhous and lardaceous at more advanced periods. Women are certainly more subject to the malady than males, and more especially after the cessation of menstruation. Some local injury, as a blow on or near the part, has sometimes appeared to excite the disease; but generally the particular cause has not been recognised; and it is not improbable, that the tendency to the complaint has arisen out of a constitutional vice or tendency.

115. *D.* The *treatment* of this malady is very unsatisfactory. But, although it admits not of cure, unless in those rare cases in which the anus only is affected, and even in these most rarely, and at an early stage, much may be done in palliating the symptoms, and even in prolonging life. The encephaloid or fungoid variety generally runs a rapid course, especially when it is attended by frequent discharges of blood; whilst the more cartilaginous, scirrhous, or lardaceous form may last for years. Diluent, emollient, and anodyne injections are generally requisite in this state of disease, in conjunction with those means, internal and constitutional, which I have advised for cancer in other parts. (See art. CANCER, § 29. *et seq.*) Sir B. BRODIE recommends opiate injections, and injections of linseed oil, either in a pure state or conjoined with limewater, with the view of allaying irritation; he gives alkalies internally, with balsam of copaiba; and he very justly considers the preparations of opium to be indispensable, notwithstanding the inconveniences attending the

use of them. Suppositories of conium or of henbane, or of both conjoined, or of opium with camphor, Peruvian balsam, or zinc ointment; mucilaginous injections, containing the chloride of zinc or creasote, with the solution of opium or syrup of poppies; and such laxative, emollient, and anodyne enemata as the state of the case may suggest, especially those with warm olive oil, with small quantities of camphor or balsam, will generally afford considerable relief. According to Mr. Calvert, much benefit is derived from "carefully introducing a hollow tube of elastic gum, through which the fæces are drawn off by injecting tepid water."

116. Of internal remedies, I can add nothing to those recommended for cancer in another place. (See art. Cancer, §§ 29. *et seq.*) The preparations of *iron* with narcotics, especially the mistura ferri comp., with liquor potassæ, tinctura conii, or tinctura opii, or tinctura camphoræ comp.; or the iodide of iron in syrup of sarza; or the pilula ferri composita with the pilula saponis cum opio, may be prescribed and varied according to circumstances. As to resorting to excision of the part when the disease is limited to the anus or lower portion of the rectum, the determination should depend upon the peculiarities and complications of the case. This subject is well discussed in the surgical works referred to, and in Mr. Cooper's Surgical Dictionary.—(*For other diseases connected with the rectum and anus, see articles* Digestive Canal, Intestines, Hæmorrhoids, Hæmorrhage *from the Bowels, and* Dysentery.)

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RHEUMATISM. — Synon. — Ῥευματισμος, a defluxion — from ῥευματίζω, to be affected by a fluxion, from ῥεῦμα, a fluxion, and that from ῥέω, I flow; — *Rheumatismus*, Pliny, Sydenham, Vogel, Juncker, Sauvages, Cullen, Pinel; — *Dolores Rheumatici*, Hoffmann; — *Myositis*, Sagar; — *Myitis*, Chrichton; — *Arthrodynia*, Cullen; — *Febris Rheumatica*, Auctor. Var.; — *Arthritis Rheumatica*, Swediaur; — *A. Rheumatismus*, Parr.; — *Cauma rheumatismus*, Young; *Arthrosia Acuta et Chronica*, M. Good; — *Gliederfluss, flusskrankheit*, Germ.; — *Rhumatisme*, Fr.; — *Reumatismo*, Ital.; — *Rheumatism, Rheumatic fever, Rheumatic pains.*

Classif. — *Class* 1st., Febrile diseases; — *Order* 2d., Inflammations with fever (Cullen). — *Class* 3d., Diseases of the sanguineous function; — *Order* 2d., Inflammations (M. Good); — III. Class; — II Order (*Author in Preface*).

1. Definit. — *Severe pains preventing, or remarkably aggravated by, motion of the affected parts; apparently seated in the fibrous structures, chiefly of the large joints, the aponeurotic expan-*

sions, and the fibro-serous surfaces; arising from external or manifest causes, and assuming various forms and complications — being sometimes remarkably acute, febrile, or inflammatory, and shifting their situations, often sub-acute, and oftener still less acute, non-febrile, unattended by heat or swelling, of chronic duration, and accompanied with debility or stiffness of the affected limb.

2. Although rheumatism is, owing to geographical and social circumstances, one of the most prevalent diseases in the British Isles, yet is it one, respecting the nature and treatment of which there exist the greatest diversity of opinion, and the least amount of undisputed knowledge. The remarkable prevalence of the malady, this diversity of doctrine, and the several very important pathological relations suggested to the thinking physician by every manifestation of rheumatic affection, are sufficient to direct investigation to the subject with greater energy than has hitherto been bestowed on it, and with more success than has hitherto signalised it.

3. Rheumatism was not described, or even noticed as a recognised malady, by the ancients, either by this term, or by any other, to which the assemblage of symptoms thus denominated can be traced. Yet the word is sometimes found in their writings, although it does not altogether represent the disorder to which the moderns have applied it, this name having been given by the former to affections, to which they attached the idea of a humoral defluxion, conformably with its derivation, especially to those characterised by mucous or pituitous discharges. * One of the earliest writers amongst the moderns, who employed this term according to its modern acceptation, treated of the subject in connection with *catarrh*, an affection to which rheumatism is closely allied, and with which it is often complicated. (See J. VIGIER, *Tract. de Catarrho Rheumatismo*, &c., Geneva, 1620. In HALLER's *Biblioth. Méd. Pract.*, t. ii. p. 376.) SYDENHAM, however, was the first to treat fully of rheumatism, and to distinguish it from gout, with which it had been frequently, if not generally, confounded by former writers under the name of *Arthritis*. Subsequently BOERHAAVE, HOFFMANN, and JUNCKER, described the disease with tolerable accuracy; but it was not until the end of the last, and the commencement of the present, century that the various metastases and pathological relations of rheumatic affections received even a partial notice.

4. I. DESCRIPTION.—Various *forms* of rheumatism have been described by authors, or rather several states of disorder, more or less intimately allied to each other, have been ranked as varieties of this disease, although certain of them might have been placed, with greater propriety, under a different category, — thus the pains in a limb or limbs caused by organic disease of the nervous centres, and the sympathetic pain produced by hepatic congestion, &c., have been often mistaken for rheumatism, and described and treated as such. Since, or at least soon after, the first notice of rheumatism as a distinct disease, two remarkable forms of it have been admitted, — the *acute* and *chronic*. Recent observation has recognised the varieties of the complaint and the pathological distinction between certain of its states, with greater accuracy; but there has been a greater disposition also among observers to multiply distinctions than to point out alliances, and pathological relations. The *division* most generally adopted of the forms of rheumatism has been that founded upon the severity and duration of the attack. It is almost identical with the foregoing, the term *sub-acute* being employed to mark intermediate states of severity. If the division into *acute*, *sub-acute*, and *chronic* be not arbitrary, it is at least conventional; but it has this recommendation, that it is simple, and involves not theoretical or pathological doctrines, nor necessarily suggests ideas as to the seat and extent of morbid changes, which vary remarkably in their associations and concomitants, in different cases, and even in the same case at different periods.

5. More recently, a pathological division has been attempted, in which distinctions are based on conditions that are contingent, varying, and uncertain; and qualitative or adjective terms have been applied as distinctive of varieties, derived from the names of the tissues, which are assumed to be the seats of the particular forms of the malady; thus we have had rheumatism denominated *capsular*, *muscular*, *periosteal*, *neuralgic*, &c., the meaning implied being that the capsules of the joints, the muscles, the periosteum, &c. are the seat of disease in each of these varieties which are respectively thus designated — an assumption at the best, and requiring proof even as respects the partial affection of these tissues, as will appear in the sequel. Instead, however, of adopting a division which is more specious than real, I shall take the one already very generally employed, and which is the most convenient for practical purposes, namely, the *acute*, the *sub-acute*, and the *chronic forms of rheumatism*.

6. i. ACUTE RHEUMATISM. — *Febrile Rheumatism.* — *Rheumatic Fever.* — *Inflammatory Rheumatism.* — This form of the disease is generally ushered in with rigors, or shiverings, or chilliness, followed by increased heat, and the usual febrile symptoms of an apparently inflammatory or sthenic character. Co-ordinately, and often contemporaneously, with chills or rigors, severe pains, impeding or altogether preventing motion, are felt in the limbs, affecting chiefly the joints or aponeurotic expansions, or tendinous sheaths, and sometimes extending in the course of the muscles, &c. As febrile reaction is established, the tongue becomes furred or loaded; thirst urgent; the pulse quick, open, bounding, and full; the bowels confined; the skin hot, at first dry, but afterwards perspiring freely; the urine scanty, high-coloured, depositing no sediment, and very acid; the appetite impaired; and sleep prevented by the aggravation of the pain, during the nocturnal exacerbation of fever. The seat and character of the pain vary in different cases; and even in the same case in different periods. Generally, at first, the pain is confined to the large joints, as the knees, ankles, elbows, shoulders; or to the

* "Si HIPPOCRATEM, GALENUM, ARETÆUM, PAULUMQUE ÆGINETAM Græcos, sive CELSUM, AURELIANUMQUE Scriptores Romanos accuratè evolveris, quod hunc morbum indubitatè designat, nihil diluciдè enodatèque descriptum invenies. PLINIUS (l. xxii. 47. 68., l. xxv. 39. 47.) quidem Rheumatismum nominavit, morbum eo nomine non omninò attigit. Sunt tamen apud eos loci, qui tamen invalitudinem quasi obiter indicant, quippe qui ei ῥευματῶν κατάδεσιν et διαθεσιν ῥευματικην, et alia hujuscemodi nomina indidant. Quæ rei quidem, hunce morbum antiquioribus nec prorsùs ignotum fuisse, nec dum tam frequenter, quàm hodie, ob oculos venisse, nobis planè demonstrat." — (*J. Copland*, De Rheumatismo. 8vo. Edin. 1815.)

aponeurotic expansions covering the large muscles; or it extends to both the joints and these expansions, attacking them either simultaneously or in quick succession. Less frequently parts of the trunk of the body, as well as one or more limbs, are so severely affected as to render the patient helpless and almost motionless. The pain, according to its situation, is most acute, severe, plunging, tearing, burning, gnawing, girding, tense, or lancinating; it is more or less constant, but exacerbated at intervals, and during the night, and by the slightest movements of the affected parts, or even by touching or pressing them, so that the pressure of the bed-clothes is hardly endured. When the joints are chiefly affected, the acute pain is often followed by increased heat, and after a time sometimes by an erythematic blush of inflammation, but more generally by swelling, rendering the joint fuller, rounder, and more manifestly swollen. The swelling is owing either to serous effusion and capillary fulness of the cellular tissue external to the fibro-serous tissues of the joint—the chief cause of it in acute rheumatism; or more rarely to serous effusion within the cavity of the joint, which more frequently occurs in the sub-acute form of the complaint. Neither the redness nor the swelling is followed by suppuration, unless in cachectic or scrofulous habits of body; and even in those, not until erosion or ulceration of the cartilages of the affected joint takes place,—an event most probably produced by changes in the fluid effused into the cavity, during low grades of vital power or reaction.

7. In acute rheumatism, the fever is sthenic or inflammatory, more in appearance than in reality, and generally presents the usual concomitants of this fever, with remarkable severity of pain, which is always disposed to shift its place; this disposition even being the greatest, or occurring most frequently, when the exacerbation is the most severe. All the febrile symptoms, and even the pain itself, manifest more or less of a *remittent* character. This circumstance is of importance as respects both the nature and the treatment of the malady. The pulse is excited, broad, open, bounding, compressible, and sometimes full; varying commonly from 84 to 100 during the day; but rising generally to 96 or even up to 112 during the night. In some cases, slight chills usher in the evening exacerbation of fever; and occasionally the symptoms are more severe on alternate days, especially in some localities. The veins are generally full, and blood taken from them furnishes a firm coagulum covered by a firm, thick, buffy coat, which by its contraction from the circumference renders the upper surface of the coagulum more or less cupped. This state of the blood continues, notwithstanding the frequent repetition of bloodletting, the coagulum becoming smaller in relation to the amount of serum. (See §§ 60. *et seq.*)

8. The secretions are all impaired or changed at the commencement. The tongue is either loaded or furred, or both; the mouth is clammy and dry; and thirst is generally experienced and increased during the night. The bowels are confined, unless fæcal accumulations have formed from neglect, when they may become loose from the irritation thus produced. The urine continues scanty and high-coloured until the febrile action begins to subside, when it deposits a copious sediment, of a brownish-red colour, resembling brick-dust. The skin is dry at first; and generally continues dry during the day and early part of the night; but as the nightly exacerbation of pain remits towards morning, the skin becomes moist, and a profuse perspiration breaks out; but without any remarkable or permanent alleviation of the pain. The perspiration is generally unctuous, emitting a peculiar acid odour; and continues profuse for a considerable time, especially if the patient is placed between blankets, or partakes freely of warm diluents. In this case, the perspiration may throw out a miliary eruption on the skin.

9. These symptoms, if not affected by a perturbating treatment, or if no internal metastasis occur, generally continue about fourteen days, or even longer; when some mitigation of their intensity occurs. Although the pains have subsided, still the patient feels them when he moves the affected parts; and they generally return, but in a less severe form than before, during the night. The parts affected, even when the pain has disappeared, continue very weak, and the patient is indisposed to use them, from a feeling of inability to exert them. The frequency of the pulse and the other symptoms subside: the urine is more abundant, paler, and more turbid on cooling, and deposits a sediment; but the perspiration often still continues unctuous and offensive, and more or less profuse. If the fæcal evacuations and biliary secretions now become copious and natural, the urine more abundant, less acid, the sediment more copious, and the sweats more free, less unctuous, and have less of an acid and offensive odour, the nightly exacerbations being more slight, or nearly disappearing, the disease subsides favourably, and debility chiefly characterises convalescence; which is the more rapid and the less likely to be followed by the sub-acute or chronic states of the disease, or by relapse, the more fully the several secretions are restored; the cleaner and more natural the tongue, and the more completely the primary and secondary assimilating functions are discharged. If, on the contrary, the amendment stops half way —if it be arrested, the tongue continuing loaded, or furred; the urine acid or scanty, or much loaded; the perspiration offensive, enfeebling, and unsatisfactory; and the pulse still frequent, this state of the disease will generally pass into the *sub-acute* or *chronic*, or into both in succession, and in either these forms continue an indefinite period.*

* The following description is more minute, as respects certain points, than the above:—

"Hicce morbus ab horroribus plerumque sensuque lassitudinis; interdum et a frigore incipit. . . . Antequam febris, aut ulla ejus indicia accesserint, ægroto plerumque per triduum quadriduumve, loca certa aliquantum dolent. Indicia tamen febris unum aut alterum diem dolores constantes nonnunquam præveniunt. Dolor, qui alios alio pacto, nec eundem eâdem ratione semper occupat, febre ingravescente excruciat. Partes tamen quibus nervi, vi movendi e voluntate præditi, sofunduntur, et cœli mutationibus objectas, potissimum infestat. Quapropter membrorum superiorum inferiorumque, ut et dorsi et cervicis musculi articulique, maximè Rheumatismo laborant. . . . . Articuli majores plerumque dolent: dolor aliàs unum et alterum, aliàs plures quoque angit; nec in articulos solùm, verùm etiam in musculos aponeuroseseque tendinosas imperium exercet: movendo adaugetur: et partis dolentis rigiditas sentitur. In hoc morbo dolor nunquam constans, nisi ubi nulla neu minima quidem febris calore comitata adsit: nec eo tempore nisi quendam certum locum obtinet. Veruntamen, ut notæ febris augentur, huc illuc ex alio in alium per musculos locum transiliunt dolores

10. ii. SUB-ACUTE RHEUMATISM. — *Rheumatismus sub-acutus, — Semi-acute rheumatism, Rheumatismus semi-acutus*, FOWLER. — This variety of the disease may be merely a sequence of the acute; or it may occur primarily. In either case, it is a state of disease intermediate, as respects severity, duration, &c., between the acute and chronic, the term sub-acute being used conventionally to mark the grades or phases between the more extreme forms of the complaint. When the sub-acute state appears primarily, it is very seldom ushered in by either chills or rigors; nor is it attended by well-marked fever, unless at night, when more or less, often only a slight degree of fever and heat of skin are experienced, generally commencing in the evening and going off with perspiration in the morning; and during this febrile period, the pains are generally most severe. The pains are felt in either the extremities, the trunk, or head, — most frequently at first in one limb, and then in another, or in two or more joints of the same limb; as the knee and the ankle, or the elbow and wrist; more rarely both knees, or both ankles, or elbows. In some instances the pain flies from one joint to another, affecting different articulations, or aponeurotic expansions, in quick succession, as at an early stage of acute rheumatism; but in other cases it is stationary for some time, either in the joint or the limb, or the part of the trunk in which it is either at first or soon afterwards seated.

11. This form of the disease, although differing from the acute, chiefly in the mildness of the symptoms generally, is not altogether without fever. During the evening and night, the pulse generally rises from 70 to 80 or 90 beats, becoming also fuller and broader, and the heat of skin is increased. During the night, thirst is often complained of, and the mouth is somewhat dry and clammy. The tongue is white, or loaded, or furred. The alvine excretions are scanty and morbid; the urine is scanty, dense, high-coloured, very acid, and deposits a pink or brick-dust sediment. When the patient falls asleep, or towards morning, the skin becomes covered with a warm unctuous perspiration; and he is remarkably susceptible at all times of cold, even when he is hot in bed; and if he be at all exposed to currents of air, the pain often is aggravated, or it shifts its seat, or the joints become more stiff and painful. Although the bowels may not be remarkably costive, the biliary secretion is seldom healthy, the liver evincing more or less torpor, with retention of the secretion in the ducts and gall-bladder. The appetite is somewhat impaired; and digestion slow or difficult, and attended by flatulence. Even when the patient is able to move about during the day, the aggravation of the pain, and the presence of fever, during the night, may be such as to deprive him of sleep, or to allow him only broken slumbers, especially towards morning, for a long or indefinite time — generally for a period prolonged beyond that of acute rheumatism, or for several weeks. At last, the disease is either subdued, or it lapses into the chronic, but it is rarely superseded by an acute attack.

12. Sub-acute rheumatism is seldom accompanied by redness of the affected part. More frequently there are heat and swelling; often swelling without marked heat of the part; and then the patient complains of stiffness, and even of coldness of the joint. It is not often that more than two parts are simultaneously affected with this form of the disease; and it is more fixed in a part than acute rheumatism; and is much less disposed to metastasis. It is often, however, remarkably obstinate; and seldom evinces any disposition to amendment until the excretions are improved and the tongue becomes clean. In this form of rheumatism, also, the blood taken from a vein is often more or less cupped or covered by a buffy coat.

13. The *sub-acute* is one of the most frequent forms in which rheumatism occurs in the *dark races*, whether in the eastern or in the western hemispheres, the disease rarely assuming in them the truly acute character. It is one of the most prevailing diseases among the natives of the various countries of the East, and among the native troops in the service of the East India Company. The symptoms and progress of this form of the complaint are the same in these races as they have been now described. Mr. MALCOLMSON, whose remarks on this disease as observed among the sepoys are very instructive, states, that "the pains are worse in bed; but whatever may be the case in Europe, it is not the heat of the bed-clothes that causes this, as they come on frequently when the sun gets low, and continue for the early part of the night." This remark confirms what has been stated above, that the exacerbations of the pain are intimately associated with the return or aggravation of the febrile symptoms; this connection admitting of a ready explanation when the *causes* of the disease come under consideration, especially those which are dependent upon locality and climate.

14. iii. CHRONIC RHEUMATISM. — *Rheumatismus Chronicus; R. Diuturnus; R. Longus*, Author. — This form of the disease may follow either the *acute* or the *sub-acute*, these gradually lapsing into the chronic state; or this last state may be the primary disease, proceeding directly from the

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alium ex alio appetentes, et unde exorti, eodem recepti domicilium figunt suum.

"Febris ejusque habitus huncce morbum comitans, sub vesperem ingravescit; dolor per noctem penè opprimit, quo tamen tempore sedem mutare assolet. Nec verò dolor semper nec pyrexia se invicem ex æquo subsequuntur: signa enim febris, ut e plurimis exemplis liquet, nequaquàm augeri videntur.

"Inter ægrotandum sudores sæpè partes, rari quidem et rarò totum perfundunt corpus; nec sublevant angorem nec κρίσιν proferunt; verum-enimverò dum cæterum corpus multo perfunditur sudore, pars, quæ dolet, sæpenumerò siccescit; sæpè tamen inter morbi discessionem, articulus discruciatus sudoribus plurimis suffunditur. Postquam dolor aliquamdiu duraverit, pars corporis parùm sincera tumescere, nec ita multò post, rubescere incipit. Plurimum tamen tumoris sub specie œdematosa sine ullo rubore, frequenter adest. Partes, in quas Rheumatismus acutus imperium exercet, semper dolent, tactionemque refugiunt. Inflammatio tumorem, de quo memini, subsecuta, haud exiguam doloris partem sæpè submovet. Sub hac forma statuque, hicce morbus in circiter decimum quartum diem durat: nec exempla desunt, in quibus modò in alteras aut etiam paulò ampliùs extenditur, modò plures nundinas superat.

"*Terminatio.* — De illa Rheumatismi acuti forma, quæ felicissimè decedit, nihil est, cur multùm moremur; autem observandum est febris indicia, plerumque sub diem decimum quartum sensim decrescere: dolorem ipsum obtusiorem et constantiorem factum minùs mordere: unum et alterum articulum tantummodò afficere, et paucis post diebus ex toto quiescere: hoc pacto Rheumatismum nonnunquam, sæpè febrem ultrò desinere. Dolorem, nullâ medicorum ope adhibitâ, rariùs abire: in uno et altero etiam exemplo dolorem febremque sub idem tempus inveniri desinere; illum autem febris signa longè frequentiùs subsequi." — (*J. Copland*, De Rheumatismo, pp. 7—9.)

causes usually producing either of the forms of the complaint already described. I have remarked that the term sub-acute is merely conventional, and is intended to convey the idea of some intermediate state between the acute and chronic: hence, whilst it may be difficult to distinguish between the acute and sub-acute conditions, in many cases of the disease, it may be equally difficult to distinguish many instances of the chronic from the sub-acute. There cannot, owing to the nature of morbid actions, in relation to peculiarities of constitution, be any line of demarcation drawn between either. If it were possible to Daguerreotype disease, the likenesses even of the same malady taken in the numerous cases and phases in which we observe it, would hardly furnish two or three of them quite alike, however numerous might be the portraits obtained. How strenuous soever may be our endeavours to state the truth — to describe with accuracy phenomena which vary not only in different cases, but even also in the same case at different periods — we can only approach to the truth; and, even to make a tolerable approach, numerous circumstances, states, changes, and things must be mentioned, which, to the superficial and unthinking, may appear unnecessary or irrelevant. The terms *acute*, *sub-acute*, and *chronic*, in relation to rheumatism, must not be viewed as marking either *dynamic conditions*, or *peculiarity and limitation of seat*, or *duration of disorder*, local or constitutional, or certain *qualifying properties*; but these collectively, in connection also with *grades of severity*, between which grades, thus associated, and otherwise *variously complicated and characterised*, no line of demarcation can be drawn, however minute and conventional may be the subdivision; each state, condition, variety, or form insensibly passing into that which is the nearest to it in the scale of morbid action or structural change.

15. *A.* When chronic rheumatism *succeeds to the acute or sub-acute*, the febrile symptoms attending these forms have subsided, and with them the severity of the pain. The secretions and excretions, especially the alvine, have, however, not returned to a natural or healthy state; and the tongue and mouth are generally dry and clammy in the morning, the former being also more or less loaded. The pains* in the limb or joint assume more of an aching, gnawing, or boring character; and sometimes, instead of being aggravated at night, as is most frequently the case, they are often relieved by the warmth of bed. They are commonly now more fixed and continued, or less remittent; but much less severe, and are most frequently experienced in the shoulder, elbow, knee, and ankle; in the occipital or cervical region, in the lumbar or dorsal region, and in the ischio-gluteal region; in the wrists; and in various other parts, according as they may have been most affected previously, or exposed to external causes. Frequently, however, the pain remits in the morning or during the day, and returns with evening or night; but this in some measure depends upon the causes or circumstances of the case. If the part had previously been the seat of increased heat, redness, or swelling, these, especially heat and redness, have entirely disappeared before the chronic state had supervened, although slight swelling may still remain. As the disease continues, the pains generally abate, or intermit; exacerbations or returns of them occurring frequently from vicissitudes of temperature, weather, or slight exposures. The parts, however, still remain for some time stiff or weak, especially if the biliary and intestinal secretions be scanty or disordered.

16. *B.* When chronic rheumatism appears *primarily*, and often also after acute or sub-acute attacks, there is neither redness, nor increased heat, nor swelling of the affected part; sometimes there is even greater coldness than natural. The pain is dull, aching, or gnawing; often but slight, generally increased on motion, and attended by a feeling of weakness of the part. Frequently it is described as gnawing, boring, or merely a soreness, seated deeply, and affecting the bones. It is often remittent or intermittent; but it is often also continued, or almost constant, for a time. When it presents the former states, it is generally mitigated or removed by the warmth of bed, especially in the morning, and by a free perspiration. In some instances the pain is slight, rarely becoming severe; but although slight, it is attended by pain on motion, or a feeling of weakness, or inability of motion, when first attempted; and yet, when the attempt is made energetically, and continued so as to accelerate the circulation and promote a free perspiration, the pain is relieved or altogether removed for a time. When chronic rheumatism is thus primary, it is generally alleviated by pressure and by warmth; and it most frequently attacks, unless in cases where currents of cold air, or other causes, have acted directly on the affected parts, those joints or places which had previously been the seats of dislocation, contusions, or other serious injuries.

17. *C. Chronic Rheumatism of Joints — Chronic Rheumatic Arthritis — Chronic Rheumatic Gout. — Arthrodynia*, CULLEN. — *Rheumatic Nodosities of the Joints*, HAYGARTH. — The causes of rheumatism, when acting chiefly upon a joint

* "Dolor obtusè angit: movendo exardet: articuli ipsi obtusam et perpetuam molestiam sentiunt: frigent; neque cætero corpore sudoribus diffluente, sudant; sin sudent, sudoribus frigidis et tenacibus perfunduntur. Verùm in eodem loco dolor plerumque constat, frigore multùm adauctus, calore vel tepore quoque imminutus; præsertim si lecto æger recumbat. Rheumatismus longus premendo levatur, degravatur acutus.

"Longus plerumque maximos corporis articulos, humeros scilicet et coxas, nec dorsum rarò invadit: Quum his in corporis partibus aliquamdiu permansisset, in alias transit. Pars, quæ doluerit, morbo amoto, imbecilla et rigida perdiu manebit, et in superiorem dolorem, cœli si intemperies quidquam moveatur, facilè incidet. Rheumatismus etiam longus status remissiones si exciplas, aliquot menses, vel annos, immo et maximam vitæ partem, hoc pacto excruciabit.

"Partes dislocationibus, luxationibus et contusionibus anteà laborantes, vel prioribus ægrotationibus debilitatas, partibus anteà integris prætermissis, infirmare solet. Rheumatismus dorsi coxæque musculos aggressus, ne annoveatur, multùm renititur, et tunc quidem sexum masculinum quàm muliebre sæpiùs aggreditur.

"Diei non potest ut longus in acutum permutetur. Quidam, qui istuc sæpiùs inciderint, ibique diu laboraverint, ad articuli hydropem sæpè perveniunt. Manifesta quidem res est, membri imbecillitatem affecti, et remissionem exhalentium quæ in ligamenta capsularia ferant, necessariam inde exortam eam excitare. *Hydrarthrum* quoque in scrofulosorum articulis sæpè gignit. Rheumatismus prælongus prægravisque articuli ἀγχύλωσιν nonnunquam afficit.

"In sectis horum cadaveribus, qui diu sæpiùsque hoc morbo laboraverint, quique eodem (qui quidem perpauci sunt) obierint, articulorum membranæ crassescunt et adhærescunt; quasi glutinamentum tendinum thecis infunditur." —(*Op. cit.* pp. 10—13.)

or extremity, often occasion a chronic state of the disease remarkable for its obstinacy, and often serious as respects the consequences. After exposure to cold and humidity, or to currents of cold, humid, and miasmatous air, a joint, especially the knee-joint, the ankle, the hip-joint, elbow, or shoulder, is attacked by a sense of gnawing, aching, of soreness, fulness, stiffness, and an incapacity of moving without acute pain, or an increase of these feelings. The complaint generally continues for weeks, and, if neglected during this time, often for months, either without alleviation, or becoming much worse; the patient ultimately being unable to extend the affected limb, at least without extreme pain. The soreness, stiffness, and pain generally extend from the joint, along the fibrous structures, to a greater or less extent, the limb thus becoming the seat of severe pain. This form of rheumatism may continue for months, and at last give rise to disease of the cartilages of the joint, and its usual consequences. One of these is absorption of the cartilages, and the deposit of a smooth, ivory-like substance. Dr. CRAIGIE observes, that although this form of the disease commences in the aponeurotic expansions, it is disposed to pass from these to the periosteum, and to produce chronic morbid action both in it and in the interior of the articulations. This action occasions the removal of the synovial membrane and cartilages, and deposits in their place a porcelain-like substance, polished, but devoid of the elasticity of cartilage and of secreting power.

18. This is one of the most common forms of the rheumatic disease. It has been most ably treated of by Dr. TODD. Mr. ADAMS has denominated this affection "*Chronic Rheumatic Arthritis*," and has given a minute description of the lesions produced by it. Dr. COLLES, Mr. WILMOT, Mr. CUSACK, Mr. R. SMITH, and M. CRUVEILHIER have also devoted much attention to this very important form of chronic rheumatism. Dr. TODD justly remarks, that this affection of the joints, even when most severe, rarely causes immediate destruction of the articular textures: suppuration or ulceration seldom occurs; and when they do, he thinks that they proceed from a venous inflammation coming on in the course of the disease. The joints, however, do not always escape without serious change; for not only may the disease run on, uninfluenced by any mode of treatment, but exertions of the limb, and the painful use of the affected joint, may induce inflammation in its usual form, if it had not even previously existed, and all the effects which commonly follow it.

19. The immediate effects of the rheumatic complaint are commonly confined to the ligament of the joints, to the periosteum of the articular ends of the bones, and to the tendons of the muscles inserted into them; but these effects sometimes extend to the fibrous fasciæ. These textures, as Dr. TODD very correctly observes, become thickened, lose more or less of their natural flexibility, and I may add that they are impaired in their tonicity and vital cohesion. They are also more opaque. The synovial membranes are also thickened, evidently by an effusion of lymph in the synovial areolar tissue. In some cases the affection of the joints is followed by effusion of fluid into the synovial cavities; the pain being aggravated by pressure, but more by motion. If the effusion be moderate, it may alleviate the pain; if it be very great, the pain is chiefly the result of distention, but is then rarely so severe as previously to the effusion. This affection is most common and most marked in the knee-joints; but although it sometimes is seated in both knees simultaneously, it is rarely equally severe in both. Dr. TODD very justly observes that these changes are seldom the result of a single paroxysm, but generally ensue from frequent attacks, or upon the long continuance of the rheumatic diathesis. In these respects, the analogy with gout he considers obvious. "And, although we have no evidence of such deposits in rheumatism as the chalk-stones of gout, there are abundant indications that rheumatic matter cannot be attracted to the joints in any quantity, or with frequency, without impairing to a material extent the nutrition of their textures." (p. 164.) Without, however, disputing at this place the existence of a "rheumatic matter," the alternative of a modified vital action — a morbid or altered condition of organic nervous influence and sensibility, and a consequent change of vascular action and of nutrition — ought not to be left entirely out of view.

20. The change of the articular cartilage, which I have briefly noticed above, is very fully described by Dr. TODD, who states that it consists of a process of absorption, taking place slowly, during the commencement of which this tissue appears to divide into a number of fibres, vertical to the surface of the bone. This change resembles that produced by long maceration of articular cartilages; and depressions or grooves may be seen which gradually enlarge, unite, and leave portions of the bone uncovered. As the articular surfaces of the bones are thus deprived of their cartilaginous coverings, the pressure and friction sustained by them cause them to assume a smooth and polished surface and appearance, resembling that of very dense polished ivory. Whilst the absorption of the cartilage, and the consequent change in the articular surface of the bones are proceeding, the bones themselves near the affected joint become enlarged, chiefly by an exuberant ossific deposit around and near to the articular extremity, causing both some deformity and a mechanical obstacle to the movements of the joint. These osseous deposits are seen irregularly about the joint, and vary in shape and size. The alterations in the synovial membrane are also remarkable. This membrane is thickened and prolonged at various points into fringes or villous processes, which are soft, and of a red colour, and dip into and completely occupy depressions around the neck of the bone. Small cartilaginous bodies, of an irregular shape and size, are sometimes found in rheumatic joints. They are either loose in the cavity of the joint, or attached by pedicles formed by the synovial membrane to the inner surface of the ligaments, or to the articular surfaces. These changes cannot, I conceive, be ascribed to inflammation, but rather to a morbid nutrition, consequent upon altered organic nervous sensibility and influence in the joint, and upon the morbid state of the synovial secretion.

21. This disease of the joints, generally consequent upon prolonged and repeated attacks of

chronic rheumatism, is most prominently manifested in the hip joint; and, as occurring in this situation, it has been described by Sandifort, Boyer, B. Bell, and, more recently, by Mr. Adams, Mr. R. Smith, Mr. Canton, and Dr. Todd; but, as the last-named writer remarks, this disease does not spare any of the joints. It affects all the large joints; and it has been met with in the hands and feet; in the temporo-maxillary joints, and in some of the vertebral articulations. It may show itself in early life, as well as at more advanced periods; but it is most common after thirty years of age, and amongst the labouring poor who are much exposed to vicissitudes of season and weather.

22. This form of the disease may affect several joints, but whether one or more joints, it is more rarely even remotely consequent upon acute or sub-acute rheumatism, than upon repeated attacks, or it has followed several returns of the more chronic affection. The painful symptoms characterising this form are aggravated at night, and by vicissitudes of weather, especially by easterly winds, by cold and humid states of the air, and by derangement of the biliary and digestive organs; and they often extend to adjoining parts.

23. When the *hip-joint* is the seat of this disease, both the acetabulum and the head of the femur become altered in shape, the former being deeper and wider than natural, the latter being flattened and expanded, and assuming a turnip-like shape, or being lengthened into the form of a cone. "Both surfaces are deprived of cartilage; the fatty body, which in health occupies the non-articular portion of the acetabulum, and the ligamentum teres disappear; and the eburnation is apparent to a greater or less extent over both articular surfaces. There is more or less of the exuberant osseous growths around both the acetabulum and the head of the femur; but the most remarkable feature is, that the neck of the femur is shortened, so that the position of its head with respect to its shaft is sometimes considerably altered. So remarkable is the change in the general shape of the upper extremity of the femur, that a bone thus altered has been not infrequently mistaken for an example of united fracture of the neck of the femur." (Todd, p. 174.)

24. In this disease of the hip-joint, the affected limb is much shorter than the other, and the patient appears lame. Sometimes he merely rests the toes on the ground; and if he comes down on the sole, he appears the more lame. The foot is wasted, as in fracture of the neck of the femur. As rotation is so painful as to be almost impossible, walking is attended with circumduction of the pelvis with the affected limb, the muscles of this limb being more or less wasted, and the nates of the same side flattened. The weight of the body on the affected joint occasions much pain in it; whilst the reclining posture affords ease. Mr. Adams states that this disease, when fully established in the hip-joint, rarely or never extends to the other articulations, and doubts its rheumatic origin in some instances. Dr. Todd remarks, that in some of the cases traces of rheumatism have not been apparent in the previous history; but that he has not himself met with a case in which complaint has not been made of pains of a rheumatic character in some of the other joints, although further signs of disease of the articular textures were wanting. Mr. Adams admits that this disease may have a rheumatic origin; but that falls on the great trochanter often give rise to the first symptoms. This, however, is no proof of the independence of the disease of the rheumatic diathesis; for the fall may be only the exciting cause or determining agent of the local affection. This form of rheumatism of the hip-joint attacks much more frequently the male than the female sex; whilst chronic rheumatism of the hands most frequently affects females.

25. Chronic rheumatism of *the hands* often produces much deformity of them. All the joints are liable to be affected, and the fingers are generally most deformed. "Besides the wearing away of the cartilages, the ossific growths, and the ivory-like surfaces, the joints become dislocated, and the fingers are drawn more or less out of their natural position; they are generally drawn forcibly over towards the ulnar side of the hand, overlapping each other, the innermost fingers being in a state of flexion." The extremities of the metacarpal bones are often much enlarged, and the carpus preternaturally convex in the dorsal aspect, owing to thickening or distention of the synovial bursæ. Both hands are generally affected, and sometimes also other joints. Dr. Haygarth states that the disease is almost peculiar to women, and commonly appears about the period of the cessation of the menses. Out of thirty-three women in whom he observed it, only three had it during the period of regular menstruation. It first appeared, in most of the cases, between the ages of fifty-one and sixty; he observed it only in one man. (See *Op. cit.* on *Nodosity of the Joints*, p. 152.) I have, however, seen three instances of this affection of the hands in females between the ages of thirty and forty-five, and in all these the catamenia were irregular, generally scanty and difficult.

26. iv. Of the Local and Structural States, or the Special Seats of Acute and Sub-acute Rheumatism. — It has been ably contended by Dr. F. Hawkins, and more recently by Dr. Macleod, that rheumatism presents certain differences, according as it is seated in the *fibrous* or in the *synovial tissues*. Dr. Hawkins thus distinctly states this doctrine, and in so lucid a manner as to deserve especial notice. In the *first class* of tissues, he ranks, 1st, those which serve to connect parts together, as the tendons and ligaments, and the aponeurotic expansions of tendons; and, 2dly, those which divide and envelope particular organs, as the muscular fascia and enveloping aponeuroses; the periosteum; the fibrous coats of the nerves; the membranes which have on one side a serous lining, as the dura mater and pericardium; also the fibrous sheaths of the tendons and capsules of those joints which are provided with fibrous capsules, and the ligaments surrounding other joints; and the membranes which have a mucous covering spread over them, &c. In the *second class* he includes, — 1st, the sub-cutaneous bursæ, to which the epithet mucosæ has been improperly added; — 2dly, the synovial sheaths of the tendons; — and, 3dly, the synovial capsules of the joints.

27. *A.* In the *first class* of structures, the fever and constitutional disturbance are much greater

n proportion to the degree of local inflammation than in the other; and Dr. HAWKINS considers that the heart and pericardium are chiefly prone to sympathise with the affection of the fibrous structures.

28. B. Rheumatism of the *second*, or *synovial class* of textures, is indicated by the situation, the degree, the character, and the form of the swelling, which is much greater, and occurs earlier, than that which is caused by rheumatism of fibrous structures. The swelling in rheumatism affecting chiefly the synovial membrane is that of a circumscribed fluctuating tumour, modified by the surrounding ligaments. There can be no doubt of rheumatism being more acute, and more disposed to associate with it disease of the heart, where the fibrous tissues are its chief seat, than where the synovial structures are chiefly attacked, in which latter case the disease usually assumes a sub-acute form.

§. 29. Dr. TODD remarks, that "some practical physicians have endeavoured to make a distinction between what they call synovial or bursal rheumatism and fibrous rheumatism. The natural history of the disease, however, does not warrant this distinction; for in no instances of rheumatic fever are the synovial membranes free from irritation — as evinced by the existence of effusions; and the synovial membranes can scarcely be affected without involving the fibrous tissues which surround, support, and convey the blood-vessels to them." There is certainly much truth in this remark; yet the distinctions made by Dr. HAWKINS are not without some foundation; for, although there is generally an extension of the morbid action from one tissue to another, or even co-ordinately to both, in some instances, nevertheless there is often a predominance of it in the one over the other. Viewing the rheumatic disease as altogether constitutional, although expressed more especially in particular structures, it cannot be denied that the disease assumes a more acute form, and peculiar and even more extensive associations, when predominating in non-secreting fibrous tissues, where no portion of the *materies morbi*, admitting this to exist, is effused, than when chiefly affecting a secreting surface allowing the effusion of a portion of the fluid, which fluid, when retained in the circulation, probably serves to aggravate, perpetuate, or even to complicate the attack; but, when effused, tends chiefly to aggravate or perpetuate the local affection.

30. That the fluid which is effused in the cavities of joints, during acute or sub-acute rheumatism, abounds in materials of an injurious tendency if they were retained in the blood, — that it contains more of a morbid material than in some other circumstances, is manifested by the sensible qualities of the secretions and excretions generally in this disease; and it is by no means improbable that the morbid effusion, especially when long retained in the cavity of the joint, and thereby rendered still more morbid, exerts an injurious effect upon the synovial membrane, upon the cartilages, and even upon the capsules and more external structures of the joints. One of the great errors of modern writers on rheumatism is the attempt to ascribe its several forms to a special affection of certain tissues, — to view the several varieties of the disease as resulting from their respective local affections, — to consider a local and contingent manifestation of a constitutional malady as the malady itself — a local manifestation which is always various, constantly varying, differently associated, often singularly complicated, and which, however severe in any of its seats or complications, is the painful result of pre-existent morbid conditions of a much less sensible and obvious kind, — the local and more external expression of a constitutional malady to which our pathological investigations, as well as therapeutical indications, should be more particularly directed.

31. When the *synovial membrane* of the joints is the chief seat of acute or sub-acute rheumatism, the symptoms are not so acute, but more persistent than when the fibrous tissues are mainly affected. Although two, three, or more joints may be at first attacked, a more limited number, or only one, becomes the principal seat of the disease, and the effusion into the joint is often increased. It is extremely probable that the fluid then effused is not merely an increased quantity of synovia, but that this fluid is more or less altered from the healthy state, which alteration is increased by the retention of it in the affected joint. To this circumstance, and to the irritation thereby produced in the retaining and surrounding tissues, are to be imputed not merely the obstinacy and aggravation of the complaint, but also the structural changes in the capsule, in the cartilages, and even in the ends of the bones themselves, with the inflammation which either attends or follows those changes, especially in scrofulous, cachectic, or broken-down constitutions. When the effusion is within the capsule, there is more or less projection, owing to distention, of the more yielding parts, as shown when the knee-joint is affected, the swelling being more limited than when the more external parts, as the ligaments, tendons, and aponeuroses, are the chief seat of the disease, and often fluctuating; this phenomenon never occurring unless the effusion is within the capsule.

32. I have seen this form of rheumatism most frequently in the knee-joint. In more recent and in the more sub-acute cases, the structural changes produced by the disease may not extend much beyond an increased quantity of synovia, and more or less vascular injection and thickening of the capsule, especially of the synovial membrane. In a case alluded to by Dr. MACLEOD, which terminated fatally from another disease whilst subject to a first attack of this form of rheumatism, the alterations in the joint were very similar to the above. When, however, the attacks have been frequent, or when the disease has been persistent, or the constitution in fault, or when the patient has aggravated the attack by exertion or exposure, the changes in the capsules, the ligaments, the cartilages and ends of the bones are much more serious, owing to superinduced inflammation and the contingent consequences, as respects not merely these parts, but also those more external to the capsule and in the vicinity. That suppurative disorganisation of the joint is sometimes met with during, or consequent upon, acute or sub-acute rheumatism, cannot be denied; but there is great reason to infer that the inflammation, of which the disorganisation is the effect, has been superinduced, as just stated; and that

that issue is not limited to rheumatism attacking the capsule or more internal tissues of the joint, but is occasionally extended to those cases in which it is difficult to determine whether or not the amount of the rheumatic affection was greater externally or internally to the capsule. In two cases, in private practice, attended by Mr. FERGUSSON and myself, suppuration of the knee-joint supervened; but this result was owing to the operation of the causes of inflammation subsequently to, or at least during the rheumatic attack, to unusual exertion of the affected limb, and to exposure. This *termination* of acute or sub-acute rheumatism of the joints should not be confounded with the *suppurative disease of the joints*, which is *secondary* of phlebitis, and which is not infrequent in females after delivery.

33. C. *Rheumatism affecting chiefly the Periosteum.* — *Periosteal Rheumatism.* — This state of the disease usually presents itself in a sub-acute or in a chronic form, more especially the latter; and is met with most commonly in impaired constitutions, in the cachectic and in the scrofulous. It affects those parts of the periosteum which is most exposed to the vicissitudes of temperature and weather, as those covering the tibia and ulna, the sternum, the cranium, and bridge of the nose. The disease is either attended by a slight degree of fever and aggravation of the pains at night, or is prolonged indefinitely in a chronic and non-febrile state. The pain is dull, constant, deep-seated, and referred to the bone. It is unattended by redness or evident swelling; but sometimes a slight fulness or thickening may be perceived upon a careful examination, and the pain is increased by firm pressure. The tongue, in these cases, is either loaded or furred, and the excretions are more or less disordered. The pulse is generally accelerated, often weak and compressible. That more or less thickening of the periosteum actually takes place, has been demonstrated on dissection of some of these cases. Dr. HAWKINS remarks, that this form of rheumatism is often allied with deep-seated pains, which sometimes continue fixed in the shoulder, and occasionally affect the hip. They are aggravated by any motion in the joint in any direction; which renders it probable that the fibrous capsules with which these joints are provided are here the seat of pain, and these capsules are closely interlined with the periosteum.

34. It is often very difficult to distinguish rheumatism affecting the periosteum from pains occasioned by *syphilis* or by the abuse of *mercury*. The previous history of the case should guide the diagnosis; but it may be inferred that the affection is rheumatic when the pains and the periosteal affection are decidedly local, or are confined to a single limb, or to defined portions of one or more limbs. Whereas the pains from the other causes now assigned are more dispersed or wandering, affect a greater number of places, and are seldom confined to one part until nodes are being, or have already formed. The nocturnal exacerbations are also much more severe when the disease is syphilitic than when it is rheumatic; and they moreover are generally associated with other signs of secondary syphilis. If the pains have been produced by the abuse of mercury, the swellings or enlargements of the periosteum are more remarkable, more numerous, and more defined than when the disease is rheumatic.

35. D. *Rheumatism may affect chiefly the Fibrous Envelopes of the Nerves.*—*Neuralgic rheumatism.*—*Rheumatism of the nerves.*—This form of the disease is met with in the rheumatic diathesis, from the same causes as produce rheumatism, and often in alliance with rheumatism of other fibrous structures. Yet, although pains following the course of certain nerves, and produced by exposure to cold, may be viewed as being very closely allied to rheumatism, they should not be viewed as being altogether identical with it; but, in many instances, as more intimately connected with neuralgia or with neuritis. Nevertheless, the connections of these pains with either may obtain in different cases; the one affection passing into the other by insensible degrees. Neuralgic rheumatism is observed chiefly in the *sciatic nerve* and its branches. The attack generally commences in the loins, affecting one side chiefly or solely, extending down the corresponding limb, and occasionally reaching the foot. It occupies the posterior aspect of the limb, and follows the course of the nerve. The suffering is generally very severe, and is commonly increased at night; but it is seldom so distinctly periodical as neuralgic affections are; nor is the pain so sudden in its invasion and cessation, nor so transient as that of neuralgia. The symptoms often resemble those of incipient ulceration of the cartilages of the hip. (See articles NEURALGIA, § 35., and NERVES, *affections of.*)

36. Neuralgic rheumatism is sometimes seated in the nerves of the face, usually in consequence of exposure to currents of air; is often associated with other rheumatic complaints, and sometimes even alternates with rheumatic affection of the sciatic or other nerves. This form of rheumatism is often attended, at its commencement, by a foul or furred tongue, by acceleration of pulse, by disorder of the secretions and excretions, and by biliary congestions or accumulations. It may present a *sub-acute* character; but it is most frequently *chronic*, and often very prolonged, being of several months' *duration.*

37. E. *Rheumatism affecting chiefly the Aponeuroses, Muscles, or fibrous Tissues of the Loins and Back.* — *Lumbago.* — This form of the disease may be either *primary*, or *consecutive*, or *simple*, or *associated.* When it is *primary* it is sometimes *sub-acute*, but it is more frequently *chronic*, especially when it is *consecutive* of other forms of the complaint; and in this latter case especially it is often complicated with some other form of rheumatism, as neuralgic or sciatic rheumatism. Lumbago is often confounded with other complaints, these complaints, especially congestion of the venous sinuses of the lumbar vertebræ and its consequences, congestions of the kidneys, &c., being mistaken for lumbago. This form of rheumatism is sometimes but little painful unless the muscles of the loins are called into action, more especially if the action be sudden. Owing to this remarkable increase of pain on motion, the patient either remains at rest in his bed, or on a sofa, or he walks bending forwards, and is unable to raise himself quite erect.

38. When the pains in the loins are truly rheumatic, the lower limbs and joints are seldom affected; but when they depend upon congestion

of the venous sinuses of the lumbar vertebræ, or upon congestion of the kidneys, there are, in addition to more marked disorder of the urinary excretion, symptomatic pains, numbness, cramps, or pricking, or lancinating pains in the limbs, usually in both limbs, when the venous sinuses of the spine are congested; and in one limb, if only one kidney is thus affected.

39. Rheumatism sometimes affects not only the *lumbar region*, but also the *dorsal portion*, in some instances, and in others it apparently extends to, or has advanced from, the *ischial* or the *gluteal aponeurosis* to the *lumbar* or *dorso-lumbar aponeurosis*. It is doubtful, in these cases, whether the muscles or the aponeuroses are the seat of pain. I believe that the latter are chiefly affected, the contractions of the muscles inducing pain by stretching the affected aponeurosis.

40. *F.* There are various *other parts* of the body in which rheumatism sometimes appears, independently of those more *internal parts* which it sometimes attacks either contemporaneously with, or consecutively upon, an affection of the external structures. (See § 47. *et seq.*) Of the manifestations of rheumatism in these external parts, little notice is required at this place, as the more important topics connected with them are discussed under other heads. It is necessary only to mention what these localities are, and the usual forms in which the disease affects them. — (*a.*) *Rheumatism of the head, — Cephalagia rheumatica, — Epicranial rheumatism.* — The rheumatic affection may appear either primarily or consecutively in the head, in a chronic or subacute, very rarely in an acute form. It may affect either side of, but very seldom the whole head; and it may be seated in the frontal and temporal regions, or in the occiput. It appears to be seated in the epicranial aponeuroses of these situations, and not in the periosteum. (See art. HEADACH — *Rheumatic and Arthritic*, § 29. *et seq.*)

41. (*b.*) *Rheumatism of the neck, — Cervical rheumatism, — Torticollis, — Crick in the neck.* — This, as well as the preceding local form of the complaint, generally follows the action of currents of cold air, or other kinds of exposure to cold, or to cold and moisture. The pain affects chiefly either the back or one side of the neck; and in this latter case the head is held to one side, or held awry, and is always inclined so as to relieve the suffering part. The neck is sore, stiff, and incapable of motion, unless with great increase of pain. This form of the complaint is often complicated with the preceding, and is apparently seated in the cervical aponeuroses.

42. (*c.*) *Rheumatism of the face, — Facial rheumatism, — Facio-temporal rheumatism.* — This form may be associated with either of the foregoing; and especially with rheumatism of the head (§ 40.). The pains may commence in either the temples or in the face, on one side, or in both at the same time. It is liable to be confounded with tic douloureux, or *neuralgia facialis*, or with toothach, with which latter it not infrequently alternates, or even is associated; the same exciting causes producing either or both. It is sometimes, also, complicated with severe attacks of catarrh, or with catarrhal fever; and, in rarer instances, it either is seated chiefly in, or extends to, the sclerotic coat of the eye, forming *rheumatic ophthalmia*. (See EYE, *Diseases of*, § 96. *et seq.*)

43. (*d.*) Rheumatism may likewise be seated in, or extend to, the *aponeurotic investments* of the *intercostal muscles*, or these muscles themselves, according to the opinion of some writers. It has, in this situation, been usually denominated *pleurodynia*, or spurious pleurisy, under which head it has been considered. It may also affect the aponeurotic expansions, or fibrous tissues of any part of the *abdominal parietes*, although the disease is seldom observed in these parts. Its affection of, and metastasis to, *internal organs or structures* are considered in the sequel.

44. II. GONORRHŒAL RHEUMATISM; — *Specific rheumatism.* — Rheumatism affecting chiefly the capsules of joints and the synovial membranes not infrequently occurs in the course of other constitutional and cachectic diseases, especially *gonorrhœa*, the venereal or mercurial cachexy, or other states of general taint. It is, however, only in connection with gonorrhœa that I have to view the complaint at this place. — *a.* The rheumatic affection generally supervenes upon gonorrhœa, about ten days, or a fortnight, or three weeks, from the first appearance of the urethral discharge, which usually is very much diminished, or has entirely disappeared, when the former is developed; and the one affection may alternate with the other, and become remarkably obstinate, especially when neglected at first, or injudiciously treated. The *cause* of rheumatism thus supervening upon, and more or less superseding, the gonorrhœal discharge, is not very manifest. The operation of the usual causes of rheumatism upon a constitution affected by gonorrhœa, and previously exhausted by seminal discharges, seems the chief source of the malady; but, in some instances, the exciting causes are not evident, the gonorrhœal infection both predisposing to and determining the rheumatic disease. Probably diathesis is much concerned in producing the attack, the gonorrhœa imparting the peculiar conditions by which this form of the complaint is characterised.

45. *b.* The *symptoms* of gonorrhœal rheumatism generally appear before the urethral discharge has altogether ceased. A severe aching is complained of in one or more joints. Of four cases which were under my care, three had the knees affected; the other the ankles, and bursæ of the adjoining tendons; but the affection was severer on one side than on the other. The pain soon becomes acute and burning, and effusion rapidly appears within the capsules and bursæ, which become much distended. The external surface is rarely or never reddened or inflamed. Motion aggravates the pain, which is much exasperated during the night, causing watchfulness. The affected limb is usually kept in a semi-flexed position, and either stretching or bending it greatly aggravates the pain. This form of the disease assumes either an *acute*, *sub-acute*, or *chronic* character; the last generally following the first or second. The *acute* is always attended by fever: in a case which I lately attended, the pulse rose above 120; but more commonly the febrile symptoms are less severe than in the usual form of the complaint, and assume more of a sub-acute character, and a truly remittent form. The tongue is loaded, the bowels confined, but not so obstinately as in other states of rheumatism; and the

urine is loaded with lithates. The perspiration is copious, and somewhat offensive. Dr. Macleod states that the skin presents a pulverulent deposit, which may be scraped off in sufficient quantity to be tested, and which consists of the lithate of soda. I have not observed this. In no instance which I have seen has the urethral discharge entirely disappeared, a very scanty gleety fluid still exuding from the urethra. Several surgical writers have noticed the alternation, or the succession of gonorrhœal ophthalmia and gonorrhœal rheumatism. I have seen it only in one instance. I have not met with a case in which this form of rheumatism was complicated with, or succeeded by, cardiac or any other internal affection. In one instance there appeared a slight delirium during the acute stage.

46. The course of this complaint is very prolonged, according to the usual mode of treating it. M. Ricord states that it generally continues many months. Although the more acute symptoms may soon subside, the sub-acute and chronic stages are most obstinate. Even when it has apparently disappeared, the complaint is apt to recur, generally in a chronic form, the urethral discharge returning during the intervals. In this way it may continue a long time, and even induce serious organic changes in the affected joint.

47. III. Of the Complications, Extensions, or Metastasis of Rheumatism. — Rheumatism, especially in its acute and sub-acute forms, is a more or less *external* manifestation of a constitutional malady, during the existence of which *internal* determinations also of morbid action may appear in similar tissues and structures,—or, in other words, the constitution, being affected in an acute or sub-acute form, will throw the morbid action on the periphery of the frame, without any internal complication in persons of strong vital resistance or unimpaired power; but in those of diminished energy or vital resistance, a somewhat similar state of morbid action is apt to appear in internal fibrous and serous tissues and surfaces, either contemporaneously with, or consecutively upon, the external affection. In these latter, the vital energy is insufficient either to throw off the morbid action on distant or peripheral parts, or to protect more central structures from the invasion of this action.

48. *A.* Of the several *associations, complications*, and *metastases* of *rheumatism*, there are none of greater importance, and of more frequent occurrence, than those in which the heart and pericardium are concerned. The *endocardium*, in certain of its reflections especially, and the *pericardium*, are particularly liable to be affected, either contemporaneously with, or consecutively upon, acute and sub-acute attacks of rheumatism, — the acute more especially. Of this complication or metastasis I have fully treated, when considering the diseases of the Heart and Pericardium (§§ 129. 132. 133.), and to that article I must now refer the reader. That many cases of this *complication* present the heart as the primary seat of the disease is by no means improbable, especially in young subjects, inasmuch as I have often observed a fully developed state of cardiac affection at an early period. Dr. Todd takes a similar view of this association of the internal and external disease, and believes that it is less frequently a metastasis than is usually supposed; and states that the occurrence of the cardiac affection "is inexplicable by the doctrine of metastasis, which supposes that the cardiac inflammation has been transferred from the limbs to the heart. The truth is, that the cardiac inflammation may be primary: it frequently exists at the same time with the articular affection, and dates its origin from the same period, as it derives it from the same cause." (p. 116.) This remark is confirmatory of what I have stated at another place (see art. Heart, § 129.), and agrees with what I shall have to notice in the sequel.

49. Dr. Graves even believes that the rheumatic disease may exist without its external manifestation, and that the cardiac affection may precede the articular swellings, or may exist without any disease of the joints being manifest, especially in persons who have been formerly the subjects of acute rheumatism. Such cases as these are comparatively rare; but I have met with two cases, both in fishmongers, in which the symptoms were identical with acute rheumatism, with many of the symptoms of endocarditis, but without the external rheumatic affection. These cases were viewed and treated as internal rheumatism of the heart, and terminated favourably.

50. *B.* The *head* is variously affected in rheumatic cases. It may, as stated above (§ 40.), be the primary seat of sub-acute or chronic rheumatism in either of the parts there designated; or it may be implicated consecutively, or in the course of either of the forms of the disease. The usual states of rheumatism of the head have been considered in the article on Headachs (§§ 29. *et seq.* 50.). But the head may be differently affected from either of the modes there mentioned. —*First*, head affection, delirium, or mental disorder, in some form or other, may occur in the course of acute rheumatism, without any abatement, or with slight abatement, either of the fever or of the local disease. In these cases, the head affection is chiefly nervous, and contingent upon the febrile condition, in connection with depression of nervous or vital power. The affection of the nervous system may, however, be produced by too large or repeated bleedings, — by a rapidly induced anæmia, — or by colchicum, or by antimony, or by narcotics, and other depressing and perturbating agents. In all these cases the head affection is independent of any inflammatory action within the cranium.

51. *Secondly*, The symptoms referred to the head may appear at an advanced stage of acute or sub-acute rheumatism, most frequently of sub-acute and capsular rheumatism, attended by effusion into the cavity of the joint; and is generally followed by the subsidence of the disease of the joint. In this class of cases, always the most unfavourable, and generally occurring in persons of exhausted or depressed vital powers, or of a cachectic habit of body, the head symptoms are more or less indicative of inflammatory irritation of the brain or its membranes, often passing into effusion of serum into the ventricles or between the membranes. Although the affection of the head is attended by the partial or entire subsidence of the disease of the joint, yet it cannot be conceded that the subsidence has produced the disease within the cranium. It

should rather be considered that, during the course of the rheumatic disease, owing to the existing states of the nervous and vascular systems, influences acting on the brain or its membranes develope a morbid action in these parts which supersedes, or partially or entirely removes, that which previously existed in the joints; and that this form of head-affection is superinduced most frequently by causes acting on the mind, or on the brain and membranes, through the media of the senses, or still more directly and locally during states of vital depression, consequent either upon the duration or intensity of the disease, or upon an injudicious mode of treatment.

52. *C. Disease of the membranes of the spinal chord*, probably commencing in, or at least implicating the theca of the chord, is occasionally observed either complicated with, or immediately consecutive of, an attack of acute or sub-acute rheumatism. A case occurred to me in 1820, in which acute rheumatism of the joints, complicated with *pericarditis*, was followed by *chorea* and inflammation of the membranes of the spinal chord, soon passing into effusion of lymph, and terminating in complete general *palsy*. This case was not only demonstrative of this complication and succession of local affections, and of the appearances after death (see *London Med. Repos.* vol. xv.), but it also evinced the connection subsisting between rheumatism and inflammation of internal fibro-serous surfaces on the one hand, and between atonic spasmodic affections, chorea, and paralysis on the other.

53. When treating of the forms of paraplegia and general paralysis (see art. PARALYSIS, § 70. *et seq.*), I described certain states of that disease which depended upon inflammation of, followed by the effusion of lymph upon or between, the membranes of the spine; and which often commence in a very slight form or degree of palsy, the movements of the limbs being at first uncertain, tremulous, irregular, or spasmodic, in many respects resembling chorea, and gradually becoming still more imperfect, until they are altogether lost, sensation still remaining unimpaired. This affection, in rare cases, is consequent upon acute or sub-acute rheumatism, appearing as a transference of the morbid action from the more external parts to the theca and membranes of the spinal chord. I have met with five cases of this description, two of them in children under twelve years of age; and in three of the cases I had an opportunity of examining the spine after death. In all three, coagulable lymph was effused within the theca, and pressed upon the chord and origins of the nerves; and the venous sinuses of the vertebræ were remarkably congested. It ought not, however, to be overlooked, that inflammation of the membranes of the chord, occasioning effusion of lymph and palsy, is generally attended by severe pain in the limbs, and a girding sensation around the abdomen, which may be mistaken for rheumatism, but which is owing to the irritation at the origins of the nerves supplying the pained muscles, and may be quite independent of pre-existent rheumatism, or of the rheumatic diathesis. (See art. SPINE, ITS CHORD AND MEMBRANES.)

54. *D. The pleura* may be affected either in the course or consecutively of an attack of acute or sub-acute rheumatism; but not so frequently as may be expected. In one case, the pleura was implicated very soon after the complication of the rheumatism with pericarditis was ascertained, pleuritis with effusion rapidly supervening. The earliest writer who noticed the internal or visceral complications of rheumatism was probably BOERHAAVE (*Aphorisms*, § 1491.). He mentions the viscera in general terms; but particularises only the brain and lungs. VAN SWIETEN, in his excellent and practical commentaries, is more explicit; although even he fails in duly recognising the frequent complication of cardiac disease with rheumatism, if, indeed, this complication was as frequent in those days as in the present, which admits of some doubt *, although certain symptoms of this complication are not entirely overlooked by him; yet, in noticing these, we are surprised that more particular attention had not been directed to the state of the heart and pericardium. It is not improbable, although such cases are not frequently detected, or are often overlooked or mistaken, that rheumatism, affecting the intercostal muscles, or the fibrous tissues in the vicinity, may extend to the pleura, and be there followed by inflammation or effusion, in more numerous instances than generally supposed.

55. *E. The diaphragm* and the *peritoneum* are, as far as my experience permits the remark, more frequently affected in connection with, or consequent upon, rheumatism than the pleura. When rheumatic diaphragmitis is observed, either the pleural or the peritoneal surface presents the most evident indications of change, although the

* "Verum quandoque contingit, ut materies rheumatica admodum vaga sit, et, mox externas, mox internas, partes occupet; unde tales ægri in majori versantur periculo. Aliquando enim dolor in membris disparet, oritur pectoris anxietas, cordis palpitatio, pulsus intermittens, et, redeunte ad membra dolore, hæc symptomata disparent, pulsusque, paulo ante tremulus et intermittens, denuo æqualis et liberrimus est. Alibi describuntur plures similes morbi, qui mense Novembri 1759, in *Nosocomio Pasmanniano* aderant, quorum initium fuit horror per totum corpus, dein languor; postea dolor rheumaticus, partim vagus, partim fixus, qui omnia membra obsedit, et subinde post unam alteramve, horam cessavit, tunceque pectus oppressum fuit, et ægri incepserunt tussitare. Caput etiam doluit vario modo. Quandoque post plures horas dolor rheumaticus de novo per omnia membra diffusus est; et tunc illico desiit dolor capitis, pectoris oppressio, et tussis evanuerunt. Illæ autem mutationes in eodem ægro sæpius contigerunt.

"Hæc materies rheumatica, quandoque adeo mobilis et vaga, nisi bona curatione, dissipari possit de corpore, vel expelli, in unum locum confluit aliquando, et ingentes tumores lymphaticos producit; de quibus eadem hac paragrapho dictum fuit, quomodo in externa corporis superficie appareant, et illis pertusis, exiverit semper serum flavum viscidum, quod leni calore potuit inspissari. Cum ergo pateat, eandem hanc materiam ex artubus derivari posse ad caput, ad pectus, si nec inde salutari metastasi redeat ad artus, nec curatione expellatur de corpore, poterunt tales tumores in interioribus colligi, et pessima mala producere, imo mortem, uti cadaverum hoc morbo defunctorum sectio docuit.

"Tres ægri, in quibus serum, per universum corporis superficiem antea dispersum, subito interiora occupavit, rheumatismo perierunt. In binis cadaveribus reperiebatur copiosissima flava gelatinosa materia inter membranam pulmones ambientem et ipsos pulmones; totaque pulmonum substantia in admodum parvam molem compressa erat. Talis materies valde copiosa quoque inter piam matrem et cerebrum atque cerebellum hæsit; anteriores cerebri ventriculi simili gelatina pleni erant. In tertio ægro disparuit tumor artuum, secuta fuit difficilis respiratio, et tussis convulsiva, quæ nullis remediis obedivit; unde miser intra quatuordecim dies, omnibus viribus exhaustus, perlit. In medio pulmonis dextri detegebatur saccus, qui quinque libras seri flavi subacris reclusit. Cætera fuerant sana."—(VAN SWIETEN, *Commentaria in* H. BOERHAAVE *Aphorismos*, t. v. p. 654.)

crura, or the tendinous parts of the diaphragm, may be the chief seat of disease. When this viscus is implicated, the symptoms vary not materially from those mentioned in the article on its diseases, where, also, the connection sometimes existing between rheumatism and inflammation of the diaphragm is pointed out, conformably with the results of my observations, and with my subsequent experience. (See art. DIAPHRAGM, §§ 9. *et seq.*)

56. Although rheumatism may affect the *diaphragm* either alone, or in conjunction with one or other of its serous surfaces, or both, as a complication, extension, or metastasis of the disease, yet the *peritoneum* may be chiefly or even solely affected; the external disease either subsiding or entirely disappearing upon the development of the peritoneal affection. Rheumatic peritonitis is probably most apt to occur either during the puerperal states, or when rheumatism affects the aponeurotic expansions and fibrous structures of the abdominal muscles and parietes; but it is of comparatively rare occurrence. (See art. PERITONEUM, § 128.)

57. *F.* Rheumatism or rheumatic inflammation may attack the *ovaria*, or the *uterus*, generally upon the subsidence or disappearance of the disease from more external parts. Cases of this kind are rare. An instance of metastasis of rheumatism to the ovaria has been adduced by me at another place. (See OVARIA, § 7. *note.*) The *testes*, either one or both, may be also similarly affected; the pain being very severe, and the swelling concsiderable. Three instances of well-marked metastasis of rheumatism to the testes, of which I have preserved notes, have come under my care.

58. *G.* Of the more pure *complications of rheumatism*, there are none so frequent as those with *catarrhal fever*, or *simple catarrh*. I shall have to show hereafter that exposures to cold and humidity are more likely to produce attacks of rheumatism when malaria, even in slight grades, is superadded to these states of atmosphere, the catarrhal affection resulting equally with the rheumatism, which may assume either of its forms, but most commonly the sub-acute, slight, and chronic, from the combination of malaria with cold and humidity. Many writers, from BOERHAAVE to STOERCK, VAN SWIETEN, and others, have noticed the frequent association of rheumatism with *ague*, during some seasons, with *scurvy* in other seasons, and even with *dysentery* — complications manifestly depending upon the combination of atmospheric conditions, upon weather, season, &c.; and more especially upon exposure to cold, in conjunction with an impure or malarious atmosphere, or with exhalations of decayed vegetable and animal matter, and often with unwholesome or improper food.

59. *H.* Rheumatism is not infrequently complicated with *disorder of the catamenia*, or of the catamenial discharge. This subject has been recently noticed by Dr. TODD, who remarks that he "has been strongly impressed with the idea that the secretions of the uterus, if of an unhealthy character, and not duly thrown off, may be absorbed into the circulation, and contaminate the blood, producing symptoms of greater or less urgency;" and he adds, that he "cannot do more than propose as a query, whether, under certain circumstances, the uterus may not be regarded as a source of rheumatic or arthritic matter?" (*Op. cit.* p. 148.) I believe that in no circumstances is the uterus productive of such matter; but that it is, as I have contended in various parts of this work, a most influential agent in depurating the blood when it fully discharges its functions; and that it thus may prove, in the full exercise of these functions, the means of preventing attacks of both rheumatism and gout; whilst the imperfect discharge of the catamenial function, and of the depurating process thereby produced, may favour the development of either rheumatism or gout, the former especially before the forty-eighth or fiftieth year, especially in the rheumatic diathesis, or where the hereditary predisposition to either of these diseases exists. Hence interrupted, scanty, imperfect, or otherwise disordered states of the catamenia, may be an efficient or a concurrent cause of rheumatism; and thus catamenial disorder may be complicated with either of the forms of this disease. Hence, moreover, arises the frequency of chronic arthritic affections in females when the catamania become difficult, scanty, and altogether cease.

60. IV. OF THE STATES OF THE BLOOD AND EXCRETIONS IN RHEUMATISM. — i. OF THE BLOOD. — It becomes a matter of some interest to consider the states of the blood in rheumatism, seeing that the disease is considered by several recent writers, as it was by BOERHAAVE, BAYNARD, VAN SWIETEN, and many others, during the commencement and middle of the last century, to depend upon a *materies morbi* existing in the blood. I shall, therefore, give the results of observations and examinations of the blood; and when I come to consider the nature of the disease, I shall then notice in how far the changes observed in the blood are the pathological conditions constituting the malady, or are merely the results of the influence of the disordered organic nervous system on the blood — whether the alteration of the blood is the proximate *cause*, or is the *result*, of the disease.

61. BAYNARD had long since asserted, that the saline and acid ingredients found in the blood and urine, are present in the former in excess, owing to the non-elimination of them by the kidneys and skin; and that the excessive accumulation of them in the blood caused the rheumatic disease. It is obvious to common observation, even if not shown by NASSE, SIMON, and ANDRAL, that the blood contains more fibrine in *acute* rheumatism, than in the normal state, and that the corpuscles decrease in proportion to the excess of fibrine. The fat is also increased. In proportion to the increase of the fibrine and fat, and the decrease of the corpuscles, the whole solid residue is diminished — this state constituting what SIMON has termed *hyperinosis*, for a principal part of the science of German pathologists consists in the coining of terms. In rheumatism, especially in the febrile states of the disease, the physical conditions of the blood, rather than its chemical constitution, or its microscopic appearances, are most important to the practitioner, who cannot carry a chemical laboratory, nor even a modern microscope in his pocket, and who cannot shape his treatment according to the reports furnished by those sources, however they may aid him in forming an hypothesis. In the acute states of the disease the clot is rather small, consistent, cupped, and covered by a strong buffy coat; the cupping

and thickness of the buffy coat depending much on the deepness and shape of the vessel in which the blood is received, and upon the rapidity and size of the stream. NASSE states that the coagulum is firm; but that when the buffy coat is very strong, the consistence of the lower part of the clot is much less. JENNINGS, according to ANCELL, maintains that the clot under the buffy coat is so loose as to fall to pieces on the slightest touch. Both are right in different cases and in different stages of the disease; at least such is the result of my observations. The serum is always clear, and of a deep yellow hue. With the frequency of blood-letting the size of the clot diminishes in proportion to the amount of serum, and the cupping and buff either continue, or even increase, however far depletion may be carried.*

62. According to SIMON, ANDRAL, and GAVARRET, the quality of fibrine and of fat is always much increased during the acute form of the disease, and that of hæmato-globulin much diminished; the proportion of blood-corpuscles diminishing, and that of serum increasing with the quantity or frequency of depletion. The *first* part of the following table exhibits the maxima, minima, and mean of forty-three analyses of the blood of fourteen persons in this disease; the *second* part, the analyses of the blood in four peculiar cases.

	Water.	Solid residue.	Fibrin.	Blood-corpuscles.	Residue of serum.
Maxima -	839·6	228·4	10·2	130·0	104·8
Minima -	771·6	160·4	2 8	70·1	76·9
Mean -	805·4	194·6	6·7	101·0	86·0
Healthy blood	790·0	210·0	3·0	127·0	80·0
Case 1st.	826·8	173·2	4·8	79·0	89·4
Case 2d.	818·3	181·7	4·6	89·1	88·0
Case 3d.	815·4	184·6	4·0	82·6	98·0
Case 4th.	741·1	259·9	2·6	154·3	102·0

* Many years ago a remarkable illustration of this fact occurred in a case, which was attended by a surgeon in Walworth, to which Dr. W. and I were called at advanced stages of this disease. A man, aged about fifty, of a leucophlegmatic appearance and corpulent, had a severe attack of rheumatism of the lower extremities, for which he took, of his own accord, a large dose of croton oil. Violent hypocatharsis was the consequence, and the pain in the limbs suddenly ceased; but he was as suddenly seized with excruciating pain in the region of the heart, with extreme anxiety and palpitation. The surgeon instantly saw him, and bled him largely about the middle of the day. When he was seen again at night, he was found in no way relieved; the blood which was taken was very much cupped and buffed; and this appearance, in connection with the continuance of the distress, induced the surgeon to bleed him again the night of the same day — twice largely on the day of the occurrence of metastasis. The following morning he was no better. The second quantity of blood taken was more buffed than the first. Dr. W. was sent for, and he was bled a third time largely on the second day. The coagulum was now small, but still remarkably cupped and buffed. On the third day he was no better, and constant jactitation had supervened. He was bled the fourth time. I was requested to see him on the evening of that day: I saw the third and fourth quantities of blood taken away, the clots of which were very small, but remarkably cupped and buffed; the first and second quantities were described in consultation. The anxiety, action of the heart, and jactitation were extreme. The lips, gums, and surface were remarkably anæmied, and he presented all the appearances I have described, as indicating extreme losses of blood. (See art. BLOOD, § 53. *et seq.*) Having heard the history of the case, and observed his existing state, I expressed my belief that he could not live twelve hours. He died within that period. The surgeon and I opened the body about twenty hours after death. Adipose matter was very abundant in the usual situations; and all the tissues presented the most remarkable pallor, very much resembling the appearance of veal. There was no fluid effused in any of the cavities, and the large vessels and cavities of the heart contained very little blood, which was coagulated into fibrinous, stringy clots, which contained a very small proportion of red globules. The internal cavities, and the valves, and columnæ carneæ appeared deeply red. The pericardium was natural, but pale, and contained no fluid. The appearances generally were similar to those of an animal blooded to death. (See art. BLOOD, §§ 50 — 64.)

63. The blood in the *first* of the cases (the second part of the table) was taken from a colour-mixer under the influence of lead, to which M. ANDRAL attributes the deficiency of the corpuscles. The blood was taken in the *second* from a person who had been bled six times, and had had 200 leeches applied. The *third* was the blood from a person with incipient chlorosis; and in the *fourth*, the blood was taken from a vigorous person twenty years of age.

64. The blood of ten persons suffering *chronic* and *sub-acute articular rheumatism*, furnished, according to the analysis of ANDRAL and GAVARRET, no striking results. The proportion of fibrine in no instance exceeded 5·0, and in two cases was as low as 2·9 and 2·6. The blood-corpuscles in one amounted as high as 154·3, and the solid constituents to 259·1. In the other cases, the corpuscles were below the healthy average. As rheumatism loses its acute, febrile, and severely painful character, so the fibrine diminishes and the blood approaches, or altogether returns to the healthy state. As these forms of rheumatism are more frequently aggravated than relieved by blood-letting, I have very rarely had an opportunity of observing the state of the blood in connection with them; but, in two cases, the chief change from the healthy state, observed in sub-acute rheumatism of the head, was an increase of the fat in both; the serum having been of a very white or milky hue in one case.

65. ii. THE URINE, in rheumatism, requires constant observation, as upon its varying states modifications of treatment are often indicated. — *A.* In *acute* rheumatism the colour of the urine is generally high, sometimes of a purple-red, or thin claret. Its acid re-action is very decidedly marked; and very bulky fawn-coloured, or lateritious sediments, consisting of urate of ammonia, and occasionally of crystallised uric acid, are deposited. Acetic and phosphoric acids have also been found in the urine in this form of the disease by HENRY and VAUQUELIN. In eighteen cases, in which the urine was examined by BECQUEREL, it always presented the characters usually observed in inflammation, as long as the fever continued. The deep colour and the acid re-action were always observed. The mean specific gravity was 1022·6. In cases which threw down a spontaneous sediment it was 1025·2 to 1027·0. He found, that after large bleedings the urine assumed the characters of that in cases of anæmia. Albumen was detected in seven of the eighteen cases. Oxalate of lime is of frequent occurrence. The other constituents vary somewhat; but, as the urine of persons in sound health varies in different indi-

viduals, and in the same person at different times, no precise inference can be drawn respecting them.

66. *B. In chronic* rheumatism, and when the pains are not very acute, the urine often retains its normal characters. Of thirty seven cases, BECQUEREL found the urine unaffected in twenty: in seventeen it assumed the inflammatory character, and in nine of these it threw down a spontaneous sediment. If the complaint be very long continued, and much debility exist, the urine may, without being red or high-coloured, present a turbid, thick, or even fœtid appearance. I have generally found the urine to have an acid re-action in the chronic as well as in the sub-acute states of the disease. In some cases, and especially when the membranes and sheath of the spinal chord are implicated, the urine has contained the phosphates; and it has never been alkaline, unless much debility or vital exhaustion exists.

67. iii. THE PERSPIRATION has not received due attention in the different forms of the disease, as respects either its chemical constitution, or its quantity and sensible characters. When the perspiration is profuse, in *acute* rheumatism, minute vesicles, or sudamina, are often observed on different parts of the surface, especially the breast or trunk. The perspiration has generally an acid or peculiar offensive odour, which is less remarkable, or becomes so, when any internal complication or metastasis supervenes. Lactic acid, the ordinary free acid in sweat, is usually increased; and SIMON states that, when there is an acid odour, acetic acid is present. Persons subject to *chronic* rheumatism have these pains removed by a free or copious perspiration; and those thus subject, who do not take sufficient exercise, are generally liable to have a return of the complaint, if a sufficiently perspirable state of the skin be not preserved, the cessation or sudden suppression of this discharge often sufficing to reproduce the disorder, without any exposure or other exciting cause.

68. V. DIAGNOSIS. — Rheumatism may be confounded with gout, with scurvy, and, in the form of lumbago, with nephritic affections, or with inflammation of the membranes or substance of the spinal chord. Various affections of the joints, of the periosteum, and of the nerves, especially neuralgic affections, may also be mistaken for rheumatism.—*A.* Rheumatism is often not easily distinguished from *Gout.** In general, however, the large joints are first attacked by rheumatism, and the small joints by gout, the former disease appearing, after chills or rigors, in the acute form, and at an earlier age than the latter; and, unless at a very early period of life, gout is more disposed to affect internal organs than rheumatism; and it is generally preceded by, and sometimes associated with, more marked disorder of the stomach, liver, and kidneys. It should not, however, be overlooked, that both diseases are so nearly allied, especially in certain of their forms, as not to admit of diagnosis, the arthritic form of rheumatism, especially when affecting the small joints, and occasioning nodosities (§ 25.), nearly resembling chronic gout, and justifying the popular appellation of "*rheumatic gout.*"

69. *B.* From simple or scrofulous *inflammations of the joints*, rheumatism is often distinguished with difficulty. Rheumatic inflammation of the joints may, however, affect scrofulous persons; or inflammation of these parts may attack either the rheumatic or the scrofulous diathesis; and, although closely allied to rheumatism, as respects the former diathesis, it cannot be viewed as an instance of rheumatism of the part. In acute or sub-acute rheumatism not one joint only is commonly affected, but several, and the affection moves from one to another, and along the aponeurotic expansions; or if it be permanent in one, or intra-capsular, the distention gives the joint the appearance noticed above (§§ 28. *et seq.*). When inflammation and its consequences supervene upon the rheumatic affection, then the local disease presents the changes usually consecutive of simple inflammation of the joint, whilst the constitutional disturbance still preserves many of the rheumatic characters, and both one and the other often are influenced by atmospheric states and changes.

70. *C.* Rheumatism may approach the characters of *neuralgia*, or be associated with it. It may even affect, as stated above (§ 35.), the fibrous sheath of a nervous trunk, as in *sciatica*, or the *ischias nervosa* of COTUNNIUS. When rheumatism is complicated with that form of neuralgia which depends upon an affection of the sheath of the nerve, they may be both viewed as almost the same complaint, and differing only as implicating different seats or parts; and they generally both arise from the same cause. True neuralgia, or tic-douloureux, however, depends more upon some change affecting the origin or roots of the nerve, than upon any alteration implicating its trunk or branches, and occurs in very violent paroxysms, between which there is a complete immunity from pain; whereas, when the sheath of a nerve is attacked, there is more continued affection, more of the symptoms of neuritis, and often numbness of parts below

* "In rheumatismo discernendo a podagra chiragrave, sæpiùs falluntur medici. Sunt tamen, quæ distinguant. Medicus igitur primùm omnium, utrum ægri corpus arthritidi proclivius sit, necne, animo diligenter perpendat. Deinde quæ indicia ante apparuerint, præsertim an ventriculus affectus sit, quod quidem in rheumatismo simplice perquàm rarò fit: perturbatio autem ventriculi sive *dyspepsia*, arthritidis accessionem biduum triduumve antevenit. Qualis febris et rheumatismum et arthritidem comitatur, talis postcà animadvertenda est. Ille enim a frigore et horrore incipit, nec remissionem habet; hujus verò febris status temporibus remittit, et interdum omnia febris symptomata ex toto cessant. Tum ex ratione, quâ dolor accedit, et ubi resideat facilè dignoscitur: Rheumatismus plerumque tardè advenit, et statim ab initio articulos majores occupat: si quando minores occupet, nunquam nisi in longinquioribus morbi exemplis fieri videmus. Contrà ea tamen Arthritis multò frequentius minores, quam majores torquet; qui quidem articuli eò magis rubescunt et tumescunt. Podagra denique ætate provectiores, juniores verò rheumatismus, victimas excruciat.

"A doloribus scorbuticorum facile discriminatur. Scorbuticorum arteriæ non nisi permodicè inequaliterque micant; interdum et subsiliunt. Scorbutus etiam specie interdum lividâ, quam urina præ se fert; specie et putrescendi, quæ per totum corpus hic illic conspicitur, sese haud rarò prodit.

"A nephritide satis distinguunt 'dolor in regione renis, sæpe ureteris iter sequens, vomitus, cruris stupor, testiculi ejusdem lateris retractio aut dolor,' et dolor renum ex statu pronâ nunquam adaugendus.

"Non est, cur hæc in re, dolores, qui debilitatem e lue venerea enatam consequantur, nos in rheumatismo distinguendo fallant. Prior *syphilis*, et rerum inde ortarum cognitio, satis discriminat." — (*J. Copland, Op. cit.* p. 20.)

the seat of pain, with a sense of burning heat in the part affected.

71. *D.* Although the pains experienced by persons suffering from secondary symptoms of *syphilis* have been ascribed by some to that malady, and by others to the mercury used for its cure, yet there is reason to believe that these, or either of them, may be only a chief cause, cold and other causes concurring with them to produce the distressing pains experienced during the night, generally in the periosteum of the more exposed bones. These pains, instead of affecting the joints, or extremities of the bones, as in rheumatism, are seated chiefly in the superficies of the bodies, or shafts, of the bones, and depend on a specific form of inflammation of the periosteum with thickening and nodes. The history of the case, the previous treatment, the seat of pain, the elevation, and irregularity of the part affected, the absence of fever, and the great severity of the pain during the night, generally indicate the nature of the complaint; especially when the flat surface of the tibia, or the outside of the ulna, or of the radius, or the sternum, or the frontal or parietal bones are affected; or when eruptions, sore throat, &c. accompany the disease; or when large quantities of mercury have been prescribed.

72. VI. PROGNOSIS. — SYDENHAM places the prognosis of rheumatism in a too favourable point of view, when he says that it is rarely fatal; and VAN SWIETEN very justly remarks, that this is only the case when it is fixed in the joints; for, when acute rheumatism changes its place, it is apt to seize upon some internal viscus, and place the patient in the most imminent danger. The justness of this remark will be readily acknowledged at the present day, when the frequency of complicated and metastatic rheumatism is considered, and the influence of age, and of various states of predisposition, in favouring the complications and metastasis of the disease, is recollected. The risk of cardiac complication is especially great, — indeed, the existence of it may be inferred in the great majority of cases, under the age of puberty; and both this and other complications and metastases, already noticed (§§ 47. *et seq.*), may occur at all ages. VAN SWIETEN observes, that when an internal affection commences after the subsidence of external rheumatism, and terminates fatally at a more or less remote period, the result is too often considered as due to the internal disease, and not to the rheumatism, which is actually the cause. Whilst, therefore, acute rheumatism is attended by fever; if it occur very early in life; if the pulse be very rapid, open, and compressible; if the patient have experienced a depletory or lowering treatment, and is the subject of mental anxiety; or if the pain continue to change its place, there still exists more or less contingent risk, even although the sounds and impulse of the heart be found natural upon a careful examination, and the functions of the brain be undisturbed. If internal complication is detected, or metastasis occurs, then the patient should be considered in a state of great danger; although recovery may take place in such circumstances, or the changes which have already supervened may only remotely tend to shorten life.

73. Even the *sub-acute* and *chronic forms* of the disease may be followed by prolonged suffering, or, if seated in the joints, may be followed by irremediable, or partially remediable changes, as anchylosis, if neglected or improperly treated; and still more frequently by relapses, or by more or less suffering for months, or even years. In all cases of acute, sub-acute, or chronic rheumatism, an immunity from the disease, or from a relapse or return of it, should not be relied upon, until the tongue becomes clean, the biliary and intestinal secretions are natural, the alvine and urinary excretions are healthy, and until the perspiration is free and equable.

74. VII. REMOTE CAUSES. — i. *Predisposing Causes.* — *A. Temperament and diathesis* have some share in producing a state of predisposition to one or other of the forms of rheumatism. The disease may affect any constitution or temperament; but the bilious, melancholic, and bilio-irritable temperaments are apparently most liable to it. That there is a rheumatic diathesis — a *diathesis rheumatica* — has been asserted by most medical writers; this diathesis being hereditary. I have certainly observed numerous instances which seemed to support this opinion; but I shall give it a more particular attention in the sequel.

75. *B.* The most remarkable source of predisposition exists in the several *digestive, depurating,* or *eliminating organs,* especially the *stomach* and the *skin, kidneys* and *liver,* and even also the intestinal canal. In very few cases are the functions of the *stomach, duodenum,* and *liver* duly discharged, either for some time previously to, or during the attack. The stomach is weak, or the food unwholesome and insufficient; and the liver is torpid in function, or retentions of the secretion in the ducts and gall-bladder have taken place, until primary and secondary assimilation has been impeded or disordered, and excrementitious materials have accumulated in the blood. Whilst this state of the hepatic functions, especially when accompanied with biliary congestion or accumulation, occasions merely wandering or fixed symptomatic pains in some persons, it is often followed by attacks of either gout or of rheumatism, both in them and in others, when the predisposition to either is more fully developed, and the respective exciting causes come into operation. The functions of the other depurating organs, especially of the *kidneys, skin,* and *digestive mucous surface,* and even of the *uterus,* when imperfectly discharged, are also more or less concerned in predisposing to some form or other of this complaint; and even also in determining the particular states or complications in which it is often observed.

76. *C. Sex* has manifestly but little influence in predisposing to rheumatism; for so much depends upon exposure to the exciting causes, that those classes, whether males or females, which are thus most exposed, will present numerically the greatest predisposition. HOFFMANN is certainly not correct in considering females more predisposed than males. Rheumatism is, perhaps, more frequent in the former, in a chronic form, after the age of fifty; but, before that age, it is certainly more frequent in males. VAN SWIETEN justly remarks, that men being more exposed, by occupation, by irregularities, and by dissipation, and their numerous concomitants, are more liable than females to rheumatic affections. HAYGARTH states that he found the disease more frequent in males than in

females, in the proportion of 98 of the former to 73 of the latter.

77. *D. Age* has also no very marked influence after 15, or after puberty, if the proportion of persons living at certain ages be taken into the account. The greatest number of cases is met with between the ages of 15 and 30; but the proportion of those living at that age is greater than at a more advanced age. M. Chomel found that in seventy-three cases, thirty-five were first attacked between the ages of 15 and 30; twenty between 30 and 45; seven between 45 and 60; and 7 after 60. Two only were attacked before 15, one at 8, the other at 9 years. I have seen several cases between the ages of 5 and 15; but hardly one at that early age that was not complicated with either endocarditis or pericarditis, or with both, and even also with inflammation of the membranes of the spinal cord.

78. *E. Depressed, impaired, or exhausted organic nervous energy*, is most influential in predisposing the frame to the invasion of every form of rheumatism; and by whatever causes this energy may be weakened or exhausted, by none is this effect more manifestly induced than by premature or excessive venereal indulgences, and masturbation or self-pollution. By these, more perhaps than by other causes, is organic nervous power depressed, and the tone or healthy condition of the fibrous tissues subverted, thereby occasioning imperfect assimilation and excretion, and favouring the morbid influence and operation of causes which alter organic sensibility, and vital tone and contractility.*

79. ii. Exciting Causes.—*A.* Of these, *cold* has been viewed as the most influential, in whatever way it may be directed on the frame. In many cases, however, it is not the mere abstraction of the animal caloric from the whole or part of the frame, but the combinations of this with other influences or agents.—(*a.*) Of these combinations the most common depend upon the modes of *warming and ventilating houses and chambers* in this country. Although these modes, viz., by open fire-places and coal fires, admit of a free and healthy ventilation, provided that the air thus supplied be pure, still the body is unequally heated by them; and whilst the parts opposite the fire are inordinately excited by the radiated heat, the other parts are exposed to, and depressed by, the currents of cold air proceeding from the doors and windows to the fire-place.† To this cause, more especially, may be imputed the prevalence of the several forms of rheumatism in this country. Still more injurious are insufficient clothing, especially if it be connected with unwholesome or insufficient aliment; exposure to cold conjoined with humidity, and to currents of cold and moist air; riding in open carriages, especially at night, and without sufficient protection, and more particularly if the cold and humid air contain malaria, or exhalations from decayed vegetable matter; and living in tents, or lying and, still worse, sleeping on the ground, or on cold, damp, or wet places. This last cause is more especially injurious, inasmuch as it abstracts the animal heat, changes the natural electrical states of the body, and exposes the frame more completely to terrestrial exhalations at a time when it is most predisposed to be affected by them. In addition to these, wet-clothes, the sudden suppression of perspiration, the living in cellars or on the ground floor, or where the exhalations from the soil, or sources of vital depression are given out constantly, and even solicited by fires and ventilation.

80. The *causes* now enumerated, both predisposing and exciting, are such as depress the organic nervous energy, and weaken the functions of these organs which are actuated by the organic nervous system,—the digestive, the assimilative, the secreting and the excreting functions; thereby changing the condition of the blood, as well as more directly affecting the circulating fluids, through the heart and vessels themselves, and giving rise to morbid states of the secretions and excretions, more especially of the cutaneous and urinary excretions.

81. VIII. The Nature of Rheumatism has been much discussed during the last and present centuries. It was formerly imputed, by Baynard, Boerhaave, Van Swieten and others, to a *materies morbi* existing in the circulation, which affected particular parts in a prominent and painful manner, according to their predisposition or morbid tendency. More recently it was viewed by Stoll and Latham as an inflammation of a peculiar form, or affecting a particular series of vessels, namely, those only admitting the colourless parts of the blood, although the existence of such vessels had not been demonstrated. Cullen, C. Smith, and Bichat, considered acute rheumatism as an inflammatory state of the muscular fibres, which assumed a peculiar form, owing to the cause and the nature of the structure affected. Bichat, however, considered that this affection implicated more particularly the fibrous tissues of the joints and the aponeurotic expansions. These latter opinions were generally received when I ventured to suggest the view taken in the subjoined passage.‡ Since then

* "Inter hodiernos et nostrates potissimùm ad luxuriam et incontinentiam nimiam referendus est; et ad artes operæ sedentariæ egentes, quæ corpus intra parietes retentum et occupatum infirmant. Eos certè, qui sedentarii victum quæritant, quique sub dio ferè nunquam morantur nec ibi ad sudores mediocres exercentur, citò infirmari; nimium admodum sentire, quique irritentur justò proclviores esse; idcircò e causis extra afficientibus facilùs in valetudinem incidere, ex omnium experientiâ satis constat. Nec igitur latet, quamobrem nautas rheumatismo vacare, etiamsi præter ceteros homines, crebriores cœli mutationes, et causas omnes excitantes, subeunt. Ex hoc quoque liquet fœminas quàm mares, imbecillos quàm robustos, et antea affectos quàm immunes, sibi sæpiùs mancipare."

† "Inter causas ejusmodi, quæ patria in nostra rheumatismum longum excitare soleant, enumerari debet ratio domiciliorum calefaciendorum, quâ conclavia et cubilia nostra calore radiante temperantur. Nam adeò inæqualiter fit ignis, ut una ex parte corpus calefiat, ex altera frigeat. Huc forsitan adnumerandæ sunt creberæ vestium mutationes, vel potiùs ratio vestes induendi frequenter mutata. Rheumatismum longum et excitant cœli intemperies, tempestatumque anni assidua mutabilitas. Ubi vel hiems vel æstas incipiat, et ubi desinenda sit, certissimè distinguere prorsùs nequimus. Hiemem in media æstate et æstum interdum haud mediocrem frigoribus in mediis non rarò vidimus: quin immo intra diem unicum temperatura aëris xxx gradus sæpe percurrit. Cœlum nostrum humidum est, quippe qui insulam incolamus, cui Zephyrus et Caurus, e regione calidâ exorti, perque oceanum magnum perequitantes, madidis incubat alis; et sudorem, qui corpus leniter perfundat, subitò reprimit: ideoque morbum sopitum resuscitat, aut in iis, qui anteà vacabant, progignit."

‡ "Quidam e scriptoribus antiquioribus de rheumatismo disserentes, quales hypotheses explicaturi sumus, tales fingebant: fluidorum scilicet lentorum esse, qui

Sir C. Scudamore, Hildenbrand, and Todd, have advanced different views as to the pathology of this disease. The first of these writers has regarded rheumatism as pain of a peculiar character, with or without inflammatory action, affecting several tissues at the same time, but chiefly the white fibrous tissues of the joints and muscles. "In acute rheumatism, he conceives the morbid action to be seated in the ligaments, the tendons, the aponeurotic membranes, and the bursæ, but in the ligaments most frequently. In the subacute form, though any of these textures, and even the nerves, may be affected, the disease is most frequently confined to the bursal, that is the synovial texture surrounding the tendons. In the chronic form, though the disease may occur in the ligaments and tendinous tissues, he represents it as most common in the sheaths of the tendons and the aponeurotic membranes."

82. Hildenbrand is more elaborate in his consideration of this subject than any recent writers. He views it as a specific form of inflammation, affecting fibrous, or serous, or fibro-serous membranes, and differing from other specific inflammations proceeding from atmospheric conditions and changes — from catarrhal inflammations which affect mucous surfaces, from erysipelatous inflammations which attack the skin, and from phlegmonous inflammations which appear in any structure. Pain he considers, to be the chief characteristic, or eminent *vaßos* of the complaint, the other characters of inflammation either being absent or contingently present. He considers that the imponderable agents, light, heat, and electricity, are chiefly concerned in the causation of the disease; states of the air, alterations of the temperature and conditions of the surface of the body, &c. subverting the equilibrium of the circulation, and occasioning efforts to recover the harmony subsisting between the different systems. These efforts he believes to be concerned in, or to constitute, the more immediate cause of rheumatism. I cannot refer to the numerous arguments by which he supports his views, but many of them are fallacious, and are founded on postulata. (See *Institut. Medico-Practicæ*, t. iii. p. 360. *et seq.*)

83. Dr. Todd, one of the most recent writers, has adopted a similar theory to that contended for by early writers in the last century. He observes that, on reviewing the leading phenomena of the rheumatic paroxysm, it is impossible not to perceive a resemblance of the most marked kind to some of those diseases which are confessedly due to the introduction of a morbid material into the blood; and that, as in those diseases, the fever is not relieved "until the morbid element which gives rise to it has, as it were, spent its fury on the textures to which it is attracted." He next inquires into the nature of the morbid matter, which he considers "to be the cause of the rheumatic diathesis, as well as of rheumatic fever;" and he proceeds to observe that "the two most remarkable excretions in the rheumatic diathesis, or fever, are the urine and the sweat. Both these are distinguished by the presence of an unusual quantity of free acid. The urine contains a large proportion of lithic acid; and those highly coloured deposits take place in it, which Dr. Prout supposes to arise from the formation of purpurates. The lithic acid diathesis, however, is by no means so strongly marked in the rheumatic as in the gouty state; and these excessive deposits of lithates are more to be regarded, as belonging to the paroxysms, than as constant concomitants of the diathesis. The high colour of these deposits is more marked in rheumatism than in gout. The sweat of rheumatism is much more copious than that of gout; and is evidently much more acid. In the latter disease, indeed, sweating is generally absent. Lithate of soda is never found in the rheumatic paroxysm, nor in the diathesis, — and those derangements in the biliary system, which so often occur in gout, are not so apparent in rheumatism. If, with these considerations, we take into account the most frequent causes of the rheumatic diathesis and paroxysm, we shall obtain a further clue to the determination of the problem we have proposed. These causes must be admitted to be imperfect assimilation and vicissitudes of temperature, — and hence the ill-clad and badly-fed children of the poor are the most numerous victims of rheumatism. Hard work, exposure to cold and wet, bad food, are strongly contrasted as causes of the rheumatic diathesis, with the ease, comfort, and excess which give rise to the analogous one of gout. If now we remember that the skin is the great emunctory of lactic acid, and that bad food, or too little food, may give rise to its undue development, as well as too much food, it is no wonder that, as lactic acid is imperfectly excreted, through its natural channel, in consequence of the influence of cold in checking perspirations, and is too freely developed in the alimentary canal, it should accumulate in the blood and become eliminated at every point. Moreover, the long continuance of the causes which produce the defective cutaneous secretion, and the deranged gastric one, will give rise to the undue development of the lactic acid, in the secondary destructive assimilating processes; thus infecting the blood from every source, and tending to perpetuate the diathesis." (p. 142—4.)

84. There is much that is manifestly true in the above view taken of this disease; but the changes described are merely a part of the suc-

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partis affectæ vascula obstruat; quidam verò, materiam morbidam in corpore generatam, et ibi per totum corpus circulentem, donec maturuerit, ut medicatricibus naturæ viribus, per vascula emunctoria expellatur; et hujusce materiæ morbidæ expulsionem perquam necessariam ad *ἀφεσιν* vel sanationem proferendam conducere. Huncce morbum in vasculis articuli dolentis *lymphaticis* sedem habuisse, apud quosdam hodiernos hypothesis tenet. Frigus tamen cui corpus, corporisve pars objicitur, vasculorum subter cutem dispositorum contentionem, h. e. spasmum efficere, indeque partium interiorem et articulorum et fibrarum musculorum et aponeuroseôn tendinosarum inflammationem necessariò oriri, opinio jam propè universa est. Hæ hypotheses jam memoratæ, eorum quæ in rheumatismo occurrant partem tantùm explicant, itaque simul ac editæ sunt, obsolescunt.

"Ab iis tamen, qui nihil nisi musculorum fibrarum et aponeuroseôn tendinosarum statum inflammatum esse rheumatismum affirmant, quæri possit: Quarè inflammationem gangræna aut suppuratio consequi nunquam reperiatur? quæ res quidem in reliqui corporis affectionibus, quæ ex inflammatione oriuntur, sæpissimè accidit. Et quæri potest: Cur dolor hujusce morbi a cæterarum inflammationum cruciatibus tantùm differat?

"Nihil quidem, nostro judicio, obstat quò minùs rheumatismum affectionem nervorum, præcipuè ad partem affectam pertinentium, singularem, hisque inseparabilem; et ex nihilo alio nisi adauctiore corporis, ut excitetur procilivitate (vel ut vulgò dicimus ex irritabilitate, vel sensilitate adauctâ), nasci existimemus. Quarè inflammationem, non rheumatismi causam; sed hujusce affectionis singularis nervorum, sive systematis vel ad partem affectam pertinentium, effectum esse arbitremur." (*Op. sup. cit.* p. 17.)

cessive morbid conditions consequent upon the remote causes. They are, however, important changes, and have been always insisted upon by me in my lectures, and have furnished the basis for one of my chief indications of cure for many years, as shown in a work, published some time ago, in which the author states this doctrine and the treatment founded on it. He there remarks that, "in this species of fever the perspiration, urine, and saliva, will be found invariably acid, and the use of alkalies beneficial;" and he adds, that "this employment of alkalies, and the observation upon which it is founded, I derived a long time since from Dr. J. COPLAND," — (*The Simple Treatment of Disease*, by J. M. GULLY, 8vo. Lond. 1842. p. 133.) But, as I shall have to state hereafter, these are not the only changes which either constitute or prove a *materies morbi* existing in the blood, and directly causing or perpetuating rheumatism; there are other alterations which are both antecedent to, and concomitants of, these changes, and some of which are the causes of those which are more prominently manifested in the blood and in the excretions. There is every reason to infer, from the nature of the predisposing and exciting causes, and from the more immediately resulting phenomena, that the earliest changes which take place in the œconomy are depression of the organic nervous or vital energy, imperfect assimilation and impaired excretion; and that the resulting retention of effete and excrementitious materials (see Art. DISEASE, §§ 99—102. *et pluries*) is followed by morbid excretions, chiefly from the kidneys and skin. But, perhaps, the most important of the consecutive changes — consecutive especially of the morbid condition of the organic nervous system — is the increase of the fibrine of the blood and diminution of the red-globules; states which, under the influence of this system, are manifestly concerned in producing the complications and metastases which so frequently occur in acute rheumatism, and especially in those cases in which these changes in the blood are the most remarkable. After the most attentive consideration I have been able to devote to the subject, I believe that the *pathology of rheumatism* may be stated as follows: —

85. *a*. The *remote causes* or occasions of rheumatism are principally of that kind which either directly or indirectly depress the organic nervous, or vital energy of a part or of the whole body, altering the sensibility and other vital conditions and functions thus partially or more generally; and these causes, whether intrinsic or extrinsic, as respects the œconomy, affect, through the medium of the organic nervous system, the vascular system, and the blood, and ultimately the secretions and excretions.

86. *b*. These causes, especially such as impair the power of the constitution to generate animal heat, or rapidly transfer this heat from the surface, and are connected with changes in the electrical conditions of the body in relation to those of the atmosphere, — more particularly insufficient nourishment and clothing; low, humid, and cold localities; living in cellars, or upon or near to the surface of cold, damp, or clayey soils; the proximity of marshes and other sources of malaria; seasons in which the quantity of rain has been excessive, and east or north-east winds prevalent, &c. — are such as produce the most remarkable effects upon the organic, nervous, and vascular systems, thereby developing, according to peculiarity of constitution, and concurrence of causes, the several forms of rheumatism and their characteristic phenomena.

87. *c*. Owing to the greater prevalence of these causes in some districts, or countries, than in others, rheumatism is so prevalent in these as to be *endemic* as respects them; and owing to unusually wet seasons, and the prevalence of east or north-east winds, or to remarkable vicissitudes of weather and temperature, this disease has been not merely prevalent in a single district, but also so very generally diffused as to have been *epidemic*; endemic and epidemic prevalences of the complaint having been generally overlooked by writers, and hence not referred to their respective causes.

88. *d*. The nature and operation of the remote causes — the effects produced by them on the organic, nervous, and vascular systems, and consecutively upon the blood, the secretions, and excretions; and the nature of these effects, especially in acute and sub-acute forms of the disease, serve to explain the frequency of the complications and metastases of these forms; the constitution of the blood manifestly favouring the supervention of disease of internal serous or fibro-serous surfaces, and the effusion of fibrinous lymph on the affected surface.

89. *e*. There is no satisfactory proof of the lactic or acetic acids, found in the perspiration during acute rheumatism, or of the uric acid found in the urine, having existed in the blood previously to their excretion from it, and there forming a *materies morbi*. It is, on the contrary, more reasonable to infer, that the elements of these acids accumulate in the blood, owing to the operation of the predisposing and exciting causes upon the organic, nervous, and vascular systems, and upon the organs which these systems actuate; and that the accumulation or condition of these elements gives rise to these acids in the excretions as well as to the other changes in them and in the œconomy; and that these acids are probably the effect, rather than the cause, of the disease. The excess of fibrine, and diminution of red-globules, in the blood, are most probably owing to the same mode of operation of the remote causes. Even granting that these acids are in part formed in the digestive canal, and in the blood during the disease, it is not unlikely that they are also partly formed by the excreting organs, especially when their large amount in some cases are considered.

90. *f*. The great importance of the primary effects produced in the organic nervous and vascular systems, and of the consecutive changes in the blood and excretions, should direct a more intimate reference to these effects, when devising the indications and means of cure, than has hitherto been attempted. These effects, primary and consecutive, are such as require the organic nervous energy to be duly supported and developed, the exuberance of fibrine to be diminished, the tendency to the exudation of fibrinous lymph on serous surfaces to be counteracted, and the morbid conditions of the secretions and excretions to be removed by means appropriate to the respective conditions.

91. *g*. The frequency of complications and metastases of rheumatism is owing — 1st. to pre-existing tendency, lesion, or disorder of some or-

gan or part; — 2d. to exposure to some energetic cause during the rheumatic disease, as violent mental emotions, causing affections of the heart or brain; — 3d. to depletory, depressing, or exhausting means of cure, thereby lowering the vital resistance, and favouring the extension or metastasis of disease from the periphery to the centre of the frame; — 4th. to the neglect of the morbid states of the blood, especially of the exuberance of fibrine; — 5th. to the neglect of the physical and chemical states of the secretions and excretions, and of the means which these states should suggest; — 6th. to measures which act locally, and which, by suppressing the local manifestation of a general or constitutional disease, tend to the production of it in other parts, or in internal organs.

92. *h.* Rheumatism is attended by phenomena, which, however nearly allied to gout in many cases, are different as respects — 1st. the seat and character of the pain; — 2d. the state of the blood, particularly in regard of the abundance of fibrine, and the diminution of red-globules, in the former disease; — 3d. the nature of the excreted acids and salts, and the state of the excretions from the skin and kidneys (§§ 65—67.); — 4th. the seat and nature of the consecutive local changes, which in arthritic rheumatism are chiefly within the capsules and at the ends of the bones, but which, in gout, are external to the capsules, and are often attended, in chronic cases, by the peculiar gouty concretions; — 5th. the remote causes, predisposing and exciting; those of rheumatism chiefly causing a deficiency of red-globules and poorness of blood, those of gout, an exuberance of globules, and richness of blood.

93. *i.* The pain in rheumatism, whether affecting the fibrous tissues of joints, or of tendons and aponeurotic expansions, does not proceed from inflammation of these parts, or of the muscular fibre; and the increased pain on motion, or the inability of motion, is not dependent on affection of the muscles themselves; but are chiefly owing to the change in the functions and sensibility of the ganglial or organic nerves supplying these structures. When inflammation supervenes, it is owing to the influence of these nerves upon the capillary circulation of these tissues, and to the irritation of the morbid fluid exuded from them, either internally or externally, to the capsules.

94. *k.* That the disease actually originates, and continues mainly seated, in this part of the nervous system, is shown — 1st. by the nature and operation of the remote causes; — 2d. by the transition of the morbid sensibility from one part of the periphery of this system to another, — from one side or joint to that on the other, — from a superior to an inferior extremity, &c., — and, in cases of exhaustion, from the periphery to more central parts, and not in the course of the cerebro-spinal nerves. The changes in the vascular system, in the blood, and in the secretions and excretions, are the consequences of the morbid condition and excited sensibility of the ganglial nervous system. Inflammatory irritation, or action, when it supervenes, either internally or externally, is owing to this cause, or to the irritating nature of the fluid effused from the affected tissues, or to a combination of these causes; and the augmented pain on motion of an affected joint or limb, is also owing to the exalted sensibility and tenderness of the affected fibrous or fibro-serous tissues, manifested more especially when these tissues are stretched, or brought to a state of increased tension.

95. *l.* The treatment of the several forms of rheumatism, especially the acute and sub-acute, has been conducted by me since the subject first engaged my mind, in 1814, upon the pathological basis now stated; and always with a successful issue, and without internal complications and metastases, if they were not present previously to the employment of the means which this view suggested.

96. IX. TREATMENT. — The *indications* and *means of cure* advised for the several forms of rheumatism have been as different, or even opposite, as the views which have been entertained of the causes and nature of the malady; and, even at the present time, very opposite doctrines respecting the pathology and treatment of the disease are promulgated by able authorities, each one appealing to facts — too often false facts — as demonstrative of success, without giving due consideration to the influence of vital resistance or constitutional power — the *vis medicatrix naturæ* — in withstanding injurious influences and agents, and to the manifest disposition of the œconomy to return to a normal condition, where injurious causes no longer continue to operate, and where no organic injury calculated to impede or interrupt the vital functions has been produced.*

97. *i.* TREATMENT OF ACUTE AND SUB-ACUTE RHEUMATISM. — Having taken a view of the modes of treatment and means of cure which have been recommended for these forms of the disease, and having given my opinion respecting them, I shall next state the treatment which I have employed for these forms of rheumatism since the earliest period of my practice, and which I have found most beneficial in the simple forms of the disease, when no complication nor metastasis had supervened. It may, however, be remarked, that the treatment of the several forms of rheumatism must necessarily vary with the locality in which persons who are the subjects of them reside — according as the patient resides in the country, in a healthy and dry atmosphere, or in a humid and malarious air; or in a close, low, crowded, and large town, and as he has been well or ill fed and clothed. Neither should it be overlooked that a somewhat different treatment may have been required by our ancestors who drank malt-liquors, and not tea, and

* "Apud antiquiores de rheumatismi curatione nihil certi repertum: quippe qui morbum, sicut suprà memoravimus, penè ignorare, et cum arthritide confundere, viderentur. Veruntamen, ut e scriptis Græcorum patet, sanguinem mittere, movere alvum, et tepidâ perfundere solebant. Romani de rheumatismo curando nihil meminerunt; neque dubium, quin podagræ chiragræve speciem duxerint.

"E GALENI temporibus usque ad seculum decimum sextum, de hoc morbo, deque curatione ejus, nihil prorsùs repertum; nec apud Arabes quidem, ubi, Europâ ignorantiæque barbariæque nebulis obumbratâ, omnes Æsculapii filii discipulique concesserant. Sub finem seculi decimi sexti, rheumatismum ab arthritide et catarrho, quibuscum tam sæpè confusus esset, discriminavit BALLONIUS, eique iterùm rheumatismi nomen, forsan parùm feliceter, indidit. SYDENHAMIUS hunc morbum ex artis medicæ regulis submovere, et sub morbi accessionem ante omnia sanguinis missioni fisus videtur. Ferè nullus alius morbus est, cujus in curatione plura medicamentorum genera medici neoterici adhibuisse videntur. Nec mirum, quoniam unusquisque eorum, prout ipse de proximis morbi causis judicat, vel hæc remedia vel illa adhibet. Eventus felices quos a remediis quæ absolutoria existimaverint, affici sibi gratulentur, αὐτοματῶς potiùs, sive viribus naturæ medicatricibus posse attribui, haud mediocris suspicio habenda est." — (*Op. cit.* p. 22.)

spirituous liquors, as in modern times. These latter, taken even in moderation, especially when taken habitually, impair more or less the primary and secondary processes of assimilation, impart more of a nervous character to diseases, and contra-indicate the employment of vascular depletions, unless with caution and in moderation.

98. *A. Blood-letting* was recommended by SYDENHAM at an early period of his practice, and certainly to an extent which could not fail of being injurious in many instances. Of this he appeared to have become afterwards convinced; for in a letter to Dr. BRADY he admits that it impaired the strength, and favoured attacks of other diseases. He therefore trusted, at a later period of his practice, to a diet consisting chiefly of whey. SYDENHAM had probably been induced to adopt frequent bleedings for this disease at the commencement of his practice by the advice of DE BAILLOU or BALLONIUS, and RIVERIUS, who had advised this practice. BOERHAAVE also recommended large blood-letting early in the treatment; but his very able and learned commentator, VAN SWIETEN, and about the same time STOERCK, saw reason to be more cautious, and advised it only for the young and plethoric, and when the pulse is strong and full. TISSOT, PRINGLE, D. MONRO, and STOLL, also recommended free or repeated blood-letting, aided by diluents; and the practice was followed by THILENIUS and BANG, and adopted by CULLEN, with more reservation, he bringing to its aid local bleedings, diaphoretics, and purgatives. HEBERDEN was still more cautious, and contended that venesection was not suited to the majority of cases, and ought to be prescribed only for robust persons. Dr. FORDYCE had at first recourse to blood-letting; but his experience led him to infer that it favoured the occurrence of internal metastasis, and he therefore abandoned the practice. Dr. FOWLER resorted to bleeding in 41 out of 87 cases, and found that only three were cured, seven much relieved, seven partially relieved, twenty very little relieved, and four not at all benefited. Dr. LATHAM regarded blood-letting as not required, although he did not object to local bleeding by leeches, as advised by Dr. FOWLER, and trusted chiefly in diaphoretics, diluents, laxatives, and rest. Ultimately, Dr. WELLS and WILLAN came nearly to the same conclusion, as respects the treatment of the disease in London and large towns, namely, that blood-letting is either unnecessary or injurious, by enfeebling the patient and favouring internal translations of the malady. More recently Mr. BEDINGFIELD and Dr. CRAIGIE have advocated early and large blood-letting. But the former wrote when venesection was a common remedy, and was certainly less prejudicial, as respected the prevailing epidemic constitutions (from 1810 to 1825), than it has been subsequently. Dr. CRAIGIE, practising in Edinburgh, has declared in favour of blood-letting, aided by diaphoretics and cathartics, and contended that, "in order to be beneficial, it ought to be performed early in the disease, and carried to a considerable extent." He considers that the best time is within the first three or four days, or, at all events, within the first week. It should be carried, he adds, "to twenty, twenty-five, or thirty ounces at once, and within twenty-four hours to as much more;" and he attributes the want of success of FOWLER and others to the smallness of the quantity taken. M. BOUILLAUD has advocated a somewhat similar practice to the foregoing; but, instead of abstracting at once the quantity advised by Dr. CRAIGIE, he has adopted the abandoned method of SYDENHAM, and has advised a smaller quantity on more frequent occasions to be drawn.

99. I believe that the treatment of any form of rheumatism by blood-letting, as a general principle of practice, however early in the disease, to be productive of injury in some cases — of rheumatic inflammations of the internal and external membranes of the heart, of the peritoneum, pleura, synovial membranes, &c.; of delirium, prolonged convalescence, and of the degeneration of the more acute into the chronic states. I will not deny that the robust, or those in the prime of life, who live well and enjoy a wholesome air, will bear full or even copious depletion at an early period of the disease, generally without detriment, and possibly with advantage; but I am convinced, that in large cities or towns, in persons employed in warm, ill-ventilated factories, or those living in crowded rooms, low apartments, cellars, &c.; in the very young, and in the old especially; wherever there is any indication of deficiency or poorness of blood; and, *à fortiori*, in the ill-clothed and ill-fed, vascular depletion in any form is often most injurious, and always unnecessary — rarely required, even for the apparently robust; unless it be conjoined with the method of cure which I shall recommend in the sequel. (§§ 115, *et seq.*)

100. *B. Mercurials* alone, or *with opium*, have been advised for the acute and sub-acute forms of rheumatism, since the benefit produced by them in inflammations of serous membranes was shown by Dr. HAMILTON. The practice was adopted by NIEMANN, and by many modern writers, with the view of preventing the effusion or formation of coagulable lymph, especially in the internal extensions or metastases of the disease. But there is every reason to believe, that mercurials, prescribed so as to produce their specific constitutional effects, will exert but little influence either in removing rheumatism, or in preventing the affection of internal parts; although they, especially calomel, will be of service in removing biliary accumulations and congestions, in rousing the torpid functions of the liver, and when conjoined with opium, in promoting the excreting functions of the skin — an intention always necessary to be accomplished in rheumatism. But there is another preparation of mercury, which, when conjoined with other medicines, is often of service in certain forms of rheumatism, viz. the bichloride. This, when taken in minute doses with the compound decoction, or fluid extract, of sarsa, or with the decoction of cinchona or infusion of serpentaria, &c., is often of great service in some sub-acute and chronic states of rheumatism of the joints. Attempts to cure the more acute forms of rheumatism by salivation, as suggested by some writers, whilst by no means preventing, if not increasing, the risk of internal metastases, always render convalescence prolonged, and favour the degeneration of the acute and sub-acute into the chronic forms.

101. *C. Emetics*, followed by cholagogue *purgatives*, or *eccoprotics*, were much praised by LENTIN, THILENIUS, and STOLL, at a very early

period of the disease, and more especially in that state of acute rheumatism, which they denominated bilious, or in which biliary disorder was manifestly present. CLOSSIUS recommended the repeated exhibition of emetics. There can be no doubt of the propriety of the practice, in the circumstances just stated, and if the treatment be not otherwise depressing. Emetics have been rarely given in rheumatic fever in recent times; but I have prescribed them in a few cases at the commencement of the attack, conjoining them with warm cardiacs, or aromatics, or stimulants, so as to produce not only full vomiting, but also copious perspirations, as early in the disease as possible.

102. *Purgatives*, especially cholagogues, are generally required early in the disease, although they have been but little insisted on by writers, excepting BUCHHAVE and a few others. But they should be prescribed only so as to procure a free alvine evacuation, and discharge of bile, without occasioning severe catharsis; for a too violent action on the bowels, and more especially if it be conjoined with vomiting, will remarkably risk the suppression of the local affection, and cause some internal complication or metastasis of the disease, as in the very remarkable instance adduced above. In the more acute states of the disease, I have usually prescribed, as early as possible, a moderate or full dose of calomel, with ipecacuanha or James's powder at bed-time, and a purgative draught, as the compound infusions of gentian and senna with the sulphate and carbonate of magnesia, in the morning; the satisfactory operation of these being introductory to other more efficient means. In some instances, I have preferred half an ounce each of spirits of turpentine and castor oil, taken on the surface of milk, or of some aromatic water; and when the bowels do not act copiously, an enema, containing about an ounce of turpentine with ten grains of camphor, or half a drachm of assafœtida, and some common salt, will always be most serviceable. The evacuations ought to be carefully examined; and if, from their appearances, there is any reason to infer either the retention of disordered intestinal excretions, or retention or disorder of the biliary secretion, the purgatives now mentioned, or such other as the peculiarities of the case may suggest, avoiding violent measures, should be repeated occasionally, until the motions present a more healthy character. This end is not always attained by prescribing cold saline purgatives; but it will be more certainly and speedily reached by conjoining stomachics and bitters with the purgatives.

103. *D. Diaphoretics* have been recommended by many for all forms of rheumatism, but they are not equally beneficial in all, nor are all diaphoretics equally efficacious. The medicines of this class which are most serviceable are the preparations of *antimony*, either alone or with opium; *Dover's powder*, or *ipecacuanha* and *calomel* with *opium*; the *liquor ammoniæ acetatis* with *sesquicarbonate of ammonia* in full doses, and with the *spiritus ætheris nitrici*; *guaiacum*, in the form of decoction or tincture, with *ammonia*; and *camphor* with *nitre* and *opium*, or *camphor* with *James's* or *Dover's powder*, or with *antimony*, or with preparations of *ammonia*. Although the most acute states of rheumatism are generally attended by abundant sweats, which produce no relief, yet these do not contra-indicate a recourse to diaphoretics. If this course of treatment be adopted, there are certain points which should receive due attention in connection with it.—1st. All retained, accumulated, or morbid biliary and intestinal excretions should be previously removed by the means already noticed; so that the patient may not be chilled, during the diaphoretic operation, by getting up to the night-stool.—2d. The patient should be enveloped in, or have next his skin, a long flannel night-gown; or, in default of this, a cotton one; and he should sleep in soft woollen or flannel blankets, or in cotton sheets.—3d. A sufficient supply of warm antacid and saline diluents, and especially an abundance of fresh whey, or of very weak, but fresh mutton or veal tea, or barley water, should be always ready, which may be made the vehicle for diaphoretic or other medicines, and which, taken abundantly, may promote diaphoresis.

104. *a.* The *antimonial diaphoretics* are the tartar emetic in small doses; James's powder or antimonial powder, either alone or with other substances, as with alkalies, opium, camphor, &c. The alkalies and magnesia, in the state of carbonate, aid the effect of these, and neutralise the acids present in the prima via. Opium increases or insures a sudorific effect, and is generally of more or less service when thus conjoined, if biliary and intestinal accumulations and retentions have been removed, and when the symptoms are very acute, and when vital power and vascular fulness have not been too much reduced. When, however, the patient has been too freely depleted; or when there is much exhaustion; and especially if the urine indicate much free acid; or if the perspirations have an acid smell, &c., then other diaphoretics are indicated, and antimonials should be relinquished.

105. *b.* The preparations of *ammonia*, with or without *guaiacum*, or the *spiritus ætheris nitrici*, or *camphor*, or other medicines, are then, I believe, the most beneficial. If the *liquor ammoniæ acetatis* be prescribed, it should be conjoined with full doses of the sesquicarbonate of ammonia, and the spirits of nitric æther; or, if *guaiacum* be preferred, it may be given with ammonia or camphor. Guaiacum, either alone or with ammonia, was formerly much employed in rheumatism; and much praised by Dr. FOWLER; and more recently by Dr. SEYMOUR; the former preferring the simple tincture, the latter the mixture, of the pharmacopœia. I have prescribed either, but generally in conjunction with large doses of the carbonate of ammonia, or some other alkali, for reasons which will appear hereafter. The gentle operation which it often exerts on the bowels, when given in a sufficient dose, is also advantageous, but its free diaphoretic effect should always be aided by diluents, and by the regimen advised above (§§ 103.).

106. *c. Dover's powder* has been very generally employed in the several more acute states of rheumatism; but it should be prescribed either in its original form, the nitrate of potash being substituted for the sulphate, or the ipecacuanha should be given in larger doses in the form of pill. One grain of ipecacuanha, with one of opium and eight of nitre, should be given in the form of pill every two hours, until three or four doses are taken; and then this dose should not be given oftener than every tenth or twelfth hour, the ope-

ration upon the skin and urine being promoted by a copious use of diluents, containing nitre and the sub-carbonate of soda or potash, that may be rendered pleasant by the addition of the usual spices and aromatics. At the commencement of the attack, the ipecacuanha, in doses of two or three grains, may be given with an equal quantity, or somewhat more, of calomel, and a grain of opium; and be followed, after three or four doses, by a stomachic purgative, or by either of those already mentioned (§ 102.); and, after the bowels have been evacuated, the ipecacuanha, opium, and nitre, may be taken so as to procure a copious perspiration, which should be promoted by the regimen and medicated diluents already recommended. In some cases I have preferred a combination of ipecacuanha, camphor, and opium, the camphor in doses of three or five grains, with the same quantities of the ipecacuanha and opium as already advised; nitre and carbonate of soda or potass being taken freely, in large quantities of diluents or demulcents.

107. *d. Calomel* and *opium* have been recommended for their diaphoretic and alterative effect; but they should be given only at the commencement of the disease, and should then be combined, at first, with full doses of ipecacuanha, and afterwards with camphor; but after a few doses—not more than three or four—a purgative should be taken, and its operation promoted by an enema, (see § 102.)

108. *E.* The *nitrate of potass* was much employed for acute rheumatism by BROCKLESBY, RANOÏ, and THILENIUS, who gave from one ounce to an ounce and a half in the twenty-four hours, copiously diluted, and continued thus to exhibit it for five or six days, when the disease generally began to subside. I have prescribed it for many years, but not in so large doses, using it chiefly in the drink of the patient with the carbonate of potash or of soda, or prescribing it in the decoction of bark, either combined thus, or with the liquor ammoniæ acetatis, and spiritus ætheris nitrici. The intention of these writers was to excite the skin and kidneys to the due elimination of hurtful materials from the blood; my object being to rouse all the emunctories to increased action, to develope organic nervous energy, and to counteract the morbid disposition and condition of the blood.

109. *F.* The treatment of acute rheumatism has been confided chiefly to *opium*, by BRUGNATELLI, and more recently by Dr. CORRIGAN. It has been recommended also by other writers in large doses, but generally with antimony, ipecacuanha, calomel, &c. I have given as much as seven or eight grains in the twenty-four hours, in the form of the pilula saponis comp. of the pharmacopœia; but I have considered the free use of opium most advantageous in conjunction with ipecacuanha or with camphor. In the most acute states of the disease large doses of opium are easily tolerated, especially when conjoined with warm spices or aromatics, or with ipecacuanha and capsicum, and are often indispensable and most beneficial in conjunction with the alkaline and tonic treatment which I have long employed.

110 *G. Peruvian* or *Cinchona bark* was first recommended for acute rheumatism by MORTON. It was, however, objected to by CULLEN, whilst PRINGLE and HERBERDEN gave only a somewhat favourable, but an undecided, opinion respecting it. HULME, FOTHERGILL, and SAUNDERS wrote more decidedly in favour of it, and HAYGARTH entered upon an elaborate defence of the use of it for this disease; and his inferences received the support of FERDYCE and WILLAN, although Dr. PARRY offered certain objections to it, which can have no weight when duly examined by the physician who has had any experience of the operation of this medicine in acute rheumatism. I have always employed cinchona for this disease, in various states of combination, since 1819, and have, up to the present day, preferred the decoction of the cinchona cordifolia, in full doses, conjoining it with other remedies, which the stage and peculiarities of the case have suggested. But the bark should be prescribed as early in the attack as possible; and if the alvine evacuations have not been sufficient, or if biliary and intestinal colluvies still remain, it may be preceded by an emetic, and by a dose of calomel and James's powder at night, and a purgative draught in the morning; or these means may be occasionally resorted to without materially interfering with the due employment of the bark. At an early stage of the more acute cases, I have generally prescribed the decoction of cinchona with the liquor ammoniæ acetatis and nitre, often also with full doses of the spiritus ætheris nitrici, the patient having been allowed a large supply of diluents, consisting either of whey, or of water gruel or barley water containing nitre and the spirits of nitric æther. If the disease was not soon afterwards mitigated, the decoction was taken with the liquor ammoniæ acetatis, with sesqui-carbonate of ammonia, in full doses, and sometimes also, especially if the disease had been of some duration, with the tincture of serpentaria. In cases where the perspiration was copious, and the urine scanty, the decoction was prescribed with the carbonate of potash or soda, to which the ammonia and spirits of nitric æther were often added. The patient's drink generally contained an alkali instead of nitre; and the weak animal tea, mentioned above (§ 103.), was often given thus medicated, and rendered palatable by spice or aromatics; and whilst it quenched thirst, it furnished all the nourishment required. In some cases, the decoction of bark was given with a preparation of colchicum, but very rarely, unless ammonia, in full doses, was conjoined with it. (See §§ 105.)

111. Since the introduction of *sulphate of quina* into practice, the other preparations of cinchona have been much less employed. Yet in rheumatism, as well as in several other diseases, I have preferred the decoction, or the compound tincture, especially in the combinations just mentioned. In some instances, however, of the subacute and chronic disease, I have given the quina with much benefit, especially in conjunction with camphor, in the form of pill; and, where there has been much evidence of anæmia, the sulphate of iron has also been added. In some such cases, or when certain peculiarities of the case suggested a combination of tonics and purgatives, then the quina, either alone, or combined as now stated, has been given, in the form of pill, with the purified extract of aloes, or with the compound rhubarb pill, or the aloes and myrrh pill, two or three grains of either acting freely when thus combined.

112. *H. Colchicum* has been much employed in acute and sub-acute rheumatism since 1815 or 1820; but not always with sufficient caution. I have rarely given it, even in the most acute states of the disease, unless in conjunction with cinchona and an alkali; or in the evening and at night, these other medicines having been taken in the morning and during the day. One or two grains of the powder of the cormus, or of the extract, have been thus conjoined with an equal quantity of the powder of capsicum, and with three to six grains of the soap and opium pill; the smaller doses having been taken at six and ten P. M. or the large dose at nine P. M. only; the morning and middle of the day, when the remission of fever is generally observed, having been devoted to the administration of the preparations of cinchona and of the alkalies. The following has been found very serviceable.

No. 331. ℞. Magnesiæ Carbon. gr. xij: Ammoniæ Carbon. gr. vj; Vini vel Tinct. Seminum Colchici ♏ xx ad ʒss.: Tinct. Cinchonæ Comp. ʒiss. vel ʒij; Tinct. Capsici ♏ iij: Tinct. Opii. ♏ v: Aquæ Cinnam. vel Carui, et Aq. distil.: ãã ʒvj. Misce. Fiat Haustus bis terve in die sumendus.

113. *I. Aconite*, in the form of expressed juice, extract, alcoholic extract, or tincture, has been recommended by many in rheumatism, since it was first employed by STORCK, especially by THILENIUS, RANOÏ, GESNER, and LENTIN. I have tried it in several cases, both simple and complicated, having always preferred the extract or tincture prepared with rectified spirit; and according to the formula recommended by Dr. PEREIRA. Of the former, from one sixth to a fourth or half a grain may be taken every sixth or seventh hour; or from three to five drops of the latter; but either preparation should be given with caution, and the effects duly watched. I have usually prescribed the tincture in distilled water only; and the extract in the form of pill intimately mixed with liquorice powder and simple syrup; and directed whichever was prescribed to be taken in the intervals between the administration of the other medicines employed. I have considered the aconite, when cautiously used, as a powerful agent in removing the morbid sensibility and excited vascular action in acute rheumatism; but I have employed it chiefly in aid of the other means already mentioned, especially the decoction of cinchona in the states of combination noticed above (§ 110.). In the cardiac or pericardiac complications of the disease it is a valuable auxiliary to other remedies, as will be mentioned hereafter.

114. *K.* A method of cure, which Dr. TODD has called "*the treatment by elimination*," has very recently been recommended by this physician. "It is probable," he observes, "that the *materies morbi* in rheumatic fever is lactic acid. We know that the natural emunctory of this is the skin. Many chemists maintain that it will also escape by the kidneys; and if it ever does so, perhaps this is more likely during rheumatic fever than at any other time." The indications he suggests, in conformity with this view, are "to promote the action of the skin, the kidneys, and the bowels; to use antacid remedies, and to give large quantities of fluid for the free dilution of the materies morbi, and in aid of the drainage by diaphoresis and diuresis." — (*Lond. Med. Gaz.*, vol. XLII. p. 573.). To obtain these ends, he recommends Dover's powder, and the other means usually employed. But, I may remark, that this acid is not the only materies morbi: there is an increase of fibrine and colourless corpuscles in the blood, as shown above (§ 62.), and when treating of rheumatic inflammation of the surfaces of the HEART (§§ 20. 129—133.), with a disposition to their exudation on the serous surfaces, especially those of this organ, whilst the quantity of red globules is diminished. The predominance of acid has been long ago contended for; but whether the acid is formed in the stomach, as Dr. TODD supposes, or by the emunctories from the constituents of it existing in the blood or partly by both, has not been satisfactorily shown. However this may be, the treatment it suggests has been long employed in acute rheumatism, as already noticed (§ 84.). The means of cure, however, should not be limited to this single morbid material, but be extended so as to comprise other changes in the blood and nervous system; which, as Dr. TODD very judiciously argues, and as was shown above, and when describing the treatment of *rheumatic endocarditis and pericarditis* (see *Art.* HEART, (§ 144. *et seq.*), can never be removed by blood-letting alone. Indeed, in many cases of the disease, especially in those of some duration, and when there was a deficiency of red globules inferred, I have prescribed the preparations of iron, as the oxydes or carbonates, with the carbonate of some one of the alkalies.

115. ii. TREATMENT ADVISED BY THE AUTHOR.— This may be partly inferred from the remarks already made; but it depends much on the duration, seat, and form of the disease, and upon the means which have been already resorted to. The indications or intentions of cure should be directed to the removal of the morbid conditions which constitute the disease, as far as these are known, and as far as experience may have proved the efficiency of the means recommended for this purpose. We should more especially endeavour to develope organic nervous energy, so as to promote the assimilating, the depurating, and excreting functions, — to diminish morbid sensibility, — to counteract whatever disposition may exist to form acid in the prima vis, — to remove from the blood, or to neutralize the materials from which acid is formed, as well as whatever acid may be present, — to increase the quantity of red globules in the blood, when these are deficient, — to correct the morbid condition of the liquor sanguinis, — and to prevent the exuberance of fibrine and the tendency of it to concrete, and to exude in the form of a fibrinous plasma or lymph, on serous surfaces. As a prelude, however, to the administration of such means as may seem most efficient in attaining these ends, disordered or accumulated secretions and excretions should be evacuated by appropriate agents, — by medicines which moderately evacuate without occasioning vital depression or exhaustion.

116. *A.* If the patient be seen by the physician early in the attack, and if the symptoms are *acute*, he should be placed in a long flannel night gown, or between flannel or soft woollen blankets; the other parts of the regimen specified above (§ 103.) being also observed. If there be no cardiac complication, if bilious colluvies be inferred to exist, if the tongue be loaded or covered by a yellowish fur, and if the alvine excretions

have not been hitherto natural or free, an *emetic*, consisting either of ipecacuanha or sulphate of zinc, with two or three grains of capsicum, should be given, and its operation promoted by drinking a warm infusion of chamomile flowers. Soon after the emetic action has ceased, especially towards evening or night, four or five grains of *calomel*, and one and a half or two of *ipecacuanha*, and an equal quantity of *opium* and *capsicum* should be taken, and be repeated in five or six hours, if a free perspiration, or some action on the bowels has not resulted from the first dose. If the bowels continue insufficiently open, four or five hours after the second dose, or the stools offensive or morbid, a *purgative* draught may be given; or an *enema*, containing an ounce of *turpentine* and two of *sweet oil*, with a scruple of *assafœtida*, ten grains of *camphor* and a little salt, may be administered. Fæcal and bilious accumulations having been evacuated by these means, the decoction of *cinchona* ought then to be given in such combinations as the existing state of the patient will suggest, — with liquor ammoniæ acetatis, spiritus ætheris nitrici, and nitras potassæ, if the febrile action is great and the urine scanty and high-coloured, and at an early stage; — with the carbonate of the alkalies, or with ammonia or magnesia and colchicum; — or with either of the alkalies and serpentaria, if the disease is further advanced. During the liberal use of cinchona, of alkalies, &c., the states of the bowels and of the urine and perspiration should be carefully watched. If the bowels are not sufficiently open, a dose of calomel, ipecacuanha and opium may be given at night, and a draught, with half an ounce each of turpentine and castor oil, in the morning. If the biliary and intestinal excretions are sufficiently free, two grains each of opium and of ipecacuanha, with five of nitre, or three of camphor, may be taken in the evening. If the excretions manifest much acidity, the alkalies should be given liberally, both in the patient's medicine and in his drinks; and if the pain continue severe, notwithstanding the liberal employment of them, either an increased dose of opium should be given at night, or ammonia and colchicum, as noticed above (§§ 110. 112.), ought to be added to the cinchona and the alkali. I have rarely found the above means fail of producing a very decided relief in the course of three or four days, when commenced early, and when no cardiac or other complication exists. But when a joint is attacked some external means, especially such as I shall hereafter suggest, may also be employed with advantage.

117. *B.* In more prolonged cases, and when the disease had not been seen during its early stage, instead of the colchicum I have prescribed the *aconite*, as noticed above, in the intervals between the taking of the cinchona and alkalies; and, in those cases where the patient has been reduced by the duration of the disease, or by vascular depletions, or where a deficiency of the red-globules of the blood was inferred, I have employed with marked advantage the *iodide of iron* in the syrup of sarza, and the compound decoction or fluid extract of sarza. This medicine was of the most remarkable and immediate service in the case of a medical officer from India which presented features of the greatest severity and obstinacy, no other substance, excepting an occasional purgative, having been required to effect a cure, which took place in a very short time.

118. In the class of acute cases now being considered, — in the prolonged, neglected, or injudiciously treated, where the red-globules appear to be deficient, but where no internal complication or metastasis can be detected, — the preparations of *iron* with the carbonates of the *alkalies*, especially the mistura ferri composita, with the addition of the carbonate of potash or soda, will be found of great service. The following pills will also be most beneficial. If the bowels be confined, from five to ten grains of the extr. aloes purificat. may be added to the mass.

No. 332. ℞. Ferri Sulphatis gr. xij: Quinæ Disulphatis gr. xviij: Camphoræ rasæ gr. xij: Pulv. Capsici gr. vi. Pilulæ Galbani comp. ʒj: Syrupi Tolutani q. s. misce, et contunde bene. Divide massam in Pilulas xxiv; e quibus sumantur binæ vel tres, ter in die.

119. *C.* When the disease attacks the large joints in the *capsular* or *sub-acute* form, the application of leeches has been advised, especially if external redness or swelling is observed. The practice is of service in recent attacks, and in young or robust persons, more particularly if the internal treatment be such as I have already recommended, or am about to suggest. The number of leeches* should depend upon the circumstances of the case; but the benefit derived from them will be only temporary, unless the internal means used at the same time be appropriate, and unless the rest of the external treatment following the application of leeches be suitable to the local affection. After fæcal accumulations and disordered secretions and excretions have been evacuated, the means already prescribed (§§ 116, *et seq.*) should be employed; and if the more acute symptoms lapse into the sub-acute, or if a joint becomes especially affected, or, if effusion within the capsule takes place, the decoction of cinchona may be given with the *iodide of potassium*, and the solution, or the sub-carbonate, of potash. In these cases, it is important to procure as speedy absorption of the effused fluid as possible, and thereby to prevent the irritating effects of this fluid on the membranes inclosing it. This end will be best obtained by subduing, by the internal means al-

* The mode in which *local blood-letting* is practised in the Shetland Isles is curious. I here adduce the description I have given of it in another place. I have seen a similar mode adopted by the native Africans on the Grain, Ivory, and Gold Coasts; the only difference being that, instead of a ram's horn, the chief instrument in the operation amongst the native Zetlanders, a small gourd is employed by the Africans, as it was from the earliest times in countries bordering on the Mediterranean. — "Mentio hujus rei, quæ quidem in insulis Zetlandicis mihi contigit vidisse, ea mihi in mentem reducit. Scarificant et sanguinem ab ultimis usque temporibus hoc modo eliciunt: — Quam partem volunt scarificare, hanc aquâ calidâ fovent. Qui medici partes agit, is cutem sexies aut septies novaculâ perquam leviter perstringit, et cornu arietinum modicè recurvum, quod cucurbitulæ vice fungitur, apice perforato, et corio molli circumdato, partem leviter resectam applicat. Tunc foramini labia admovet, et quantùm fieri poterit, aëra inclusum exsugit. Quum cornu exinanisset, corio torquendo et in foramen linguâ protrudendo aëris irruentis impetum prohibet. Postquam cornu partem scarificatam arripit, deinde pannos ex aqua calida paulùm exsiccatos circa imum cornu superimponit, qui sanguinem ad partem provocent. Quum sanguinis semiplenum sit, cornu tum cutem relinquit et decidit. Eadem res iterum et iterum repetitur, donec satis sanguinis mittatur. Mulieres et mares, scarificatione et cornu hujusmodi uti vidimus. Res memoratu f raitan digna est, ut enim Romani antiquiores cucurbitis, sic Getæ (sive quis eos Gothos nominare malit), et omnes eorum posteri, cornibus ad sanguinem eliciendum uti videntur."

ready advised, the morbid action in the joint, by correcting the altered state of the circulating fluid, and by procuring a free discharge from the external surface of the joint. After the operation of leeches, in such cases as may appear to require them, or without having recourse to them in other cases, where they are contra-indicated by the local or constitutional symptoms, — when there is little or no local redness, and no marked increase of heat, but considerable intra-capsular swelling, — small or moderate-sized blisters may be placed near each side of the joint, as when the knee is affected, and these may be repeated, or kept discharging, according to the effects produced. In other respects, the treatment of this form of the disease, as well as of the other subacute states, may be conducted conformably with the views already entertained. It may however be remarked, that the preparation of iodine, conjoined with cinchona, alkalies, &c., or with iron, sarsaparilla, &c. when there is a deficiency of red globules, are more especially indicated in these forms of the complaint; and that colchicum, conjoined with the iodide of potassium, the alkalies and cinchona, in these forms, is often very beneficial, especially in the more active states. When the disease attacks the more superficial joints, leeches and blisters should not be placed immediately over the joint, but at a short distance from it, so as to occasion a derivation of the morbid action from the affected parts.

120. In some cases of acute and sub-acute rheumatism, I have employed the *oil of turpentine* differently from the manner noticed above. After having evacuated disordered alvine secretions and excretions, and given a few doses of the decoction of cinchona, with an alkali and nitre, I have occasionally prescribed this oil in the following, or in a similar manner; endeavouring, however, at the same time, to preserve the bowels sufficiently open, and to prevent the irritating action of the oil on the kidneys, by a liberal use of demulcents containing nitre and an alkaline carbonate: —

No. 333. ℞. Olei Terebinthinæ, ʒj; Sodæ vel Potassæ Bi-carbon. ℥j; Tinct. Cinchonæ Comp. ʒjss; Tinct. Capsici, ♏ v; Aquæ Menthæ Piperitæ, ℥jss. Misce. Fiat haustus bis terve in die sumendus.

121. iii. THE CHRONIC FORMS of rheumatism, when they appear primarily, more especially in an *active form*, or with nocturnal exacerbations, should be treated very nearly on the principles now stated. — (*a.*) After evacuating morbid accumulations and excretions, the decoction of *cinchona*, or the *guaiacum* mixture, may be given with *alkalies* and with *colchicum*. The preparations of *guaiacum*, especially when thus combined, and after the biliary and alvine secretions have been duly evacuated and promoted, I have always found more or less beneficial in this state of the disease, as well as in the sub-acute and in the more *passive* conditions. The good effects of these are more certainly secured if free excretion by the several emunctories be promoted, by a liberal use of diluents, more especially those already mentioned (§ 103.).

122. (*b.*) In the states of the complaint now being considered, as well as in the advanced stages of the acute, and in the sub-acute and arthritic forms, manifest advantage will accrue from the *iodide of potassium* in such combinations as the experience and tact of the physician will suggest, — more particularly when given in the decoction of bark, or in the guaiacum mixture, with the solution of potash, or of carbonate of potash, or with colchicum, or aconite. Besides the forms of the disease just mentioned, both the active and passive states of chronic rheumatism will be remarkably ameliorated by these means, which may be aided by the external measures about to be noticed, and by a suitable diet and regimen. In these states of combination, I have found the iodide of potassium extremely beneficial, and whilst less than two grains, given thrice daily, were rarely prescribed, more than five grains were as rarely taken at one dose; a free use of diluents being always allowed.

123. *c. The cod-liver oil* once enjoyed a considerable reputation for the cure of the sub-acute and chronic forms of rheumatism; and was much employed in Manchester since 1766, when it was first introduced by DR. KAY and PERCIVAL. Owing to the writings of this latter physician, and the reports of Dr. BARDSLEY, it came into use in Germany, where it is now one of the most commonly used medicines for the chronic forms of the disease. The work of Dr. HUGHES BENNETT on this oil has revived the credit of this remedy for rheumatism; and it is now very generally prescribed for some obstinate states of the complaint. It has from time immemorial been employed as a popular remedy for this and some other chronic disorders, both in Norway and in the Shetland Isles; the liver of the torsk — the *Gadus brosme*, being however preferred to that of the cod — the *Gadus morhua*. The oil prepared in the manner described by my friend Dr. EDMONDSTON of Shetland, in his communication to Dr. HUGHES BENNETT, is that which I believe to be the best. This latter physician has adduced the opinions of the earlier writers on this oil, and added his own, which are both discriminating and judicious. Dr. PERCIVAL remarks, that he had the fullest evidence of the successful exhibition of it in rheumatic complaints, and considered it superior to the preparations of guaiacum. Dr. BARDSLEY, much later, 1807, states that he is enabled to speak of it, from long experience, "as a medicine of efficacious but limited powers. In some instances, where every means has proved unsuccessful, it has operated in a manner so decidedly beneficial as to excite astonishment." The circumstances under which he found it most advantageous were, — 1st, in the chronic rheumatism of elderly persons, when the muscles and tendons have become rigid, and the joints nearly inflexible, owing to excessive labour, dampness, hard fare, and cold. — 2dly, In women whose constitutions have been worn out by repeated rheumatic attacks after parturition, and more especially in the decline of life. Dr. HUGHES BENNETT states that, judging from the mass of observations published in the German periodicals, and from what he has heard and seen connected with this subject, he considers this oil to be more especially indicated in three distinct forms of chronic rheumatism and gout, which may be denominated the general, erratic, and local.

124. I have prescribed the cod-liver oil in several cases of rheumatism since 1844, and chiefly in similar cases to those mentioned by Dr. BARDSLEY, and certainly with nearly similar results; the quantity having been from two to three or four table-spoonsfuls in the course of the day. It was commonly taken on the surface of milk, of cold

coffee, or mint-water, or of some aromatic water; and, in some cases, on the surface of the infusion of orange peel, to which a small quantity of the iodide of potassium was added. In two cases of sciatica in elderly persons it was quite successful; but in two cases of erratic chronic rheumatism, for which the patients had been, and still continued, in the habit of resorting to opium, the oil had no effect. Was this result to be ascribed to the influence of opium on the system? Much useful information on this subject will be obtained from Dr. H. BENNETT's treatise referred to in the BIBLIOGRAPHY to this article. (*Op. cit.* p. 70—92.)

125. (*d.*) The *compound decoction of sarza*, or the fluid extract of sarza, largely diluted, especially when conjoined with the solution of potash, or the sub-carbonate of potash, and the iodide of potassium, I have found one of the best medicines for the cure of the chronic and sub-acute forms of rheumatism. In order, however, to secure the good effects of this combination, the functions of the skin should be freely promoted by regular exercise in the open air; and the other secretions and excretions ought also to receive due attention. I have preferred the compound decoction of sarza to other preparations, in doses of about six ounces or half a pint, twice or thrice daily, as it produces a much more decided effect upon the skin, especially when taken in a tepid or warm state.

126. (*e.*) The *decoction of senega* is also often extremely beneficial, when conjoined with the iodide of potassium and potash, and with some aromatic water, which will enable the stomach to tolerate this decoction in full doses. In the complications of rheumatism with endocarditis or pericarditis, the combination of this decoction with the substances just mentioned is often most beneficial. It was found most efficacious in several cases of this complication which came under my care, two of these cases having occurred in medical men. Whilst this decoction, especially as thus combined, promotes the excretions, it also tranquillises the increased action of the heart. It may be given in the sub-acute, as well as in the several forms of the chronic disease.

127. (*f.*) The *Datura stramonium*, or thorn-apple, first employed for rheumatism by STORCK, and subsequently by WEDENBURG and ODHELIUS, and by COOPER and BARTRAM in America, has been found of service in the chronic and sub-acute forms of the complaint; and especially in sciatica, and other cases of nervous rheumatism. It may be given in the form of extract, thrice daily, commencing with a quarter or half a grain, and increasing the dose until dilatation of the pupil and giddiness are produced. I have prescribed this medicine in a few cases; but although it had considerable effect in alleviating the pain, the benefit derived from it was generally transitory. The *Rhododendron chrysanthum* has been recommended for the sub-acute and chronic forms of rheumatism by PALLAS, HOME, KOELPIN, LOEFFLER, WILLIMET, and others. I have no experience of its use in this disease, but Dr. CRAIGIE remarks, that two drachms of the dried leaves may be infused in ten ounces of boiling water all night; and the strained liquor may be taken either at once, or in divided doses during the day; and that a repetition of the remedy for three or four days in succession generally effects a cure in the forms of the complaint just specified. Very probably this infusion, as well as the extract of stramonium, may prove much more beneficial when conjoined with alkaline medicines, or with other substances already mentioned, than when given alone; but under any circumstances the effects should be carefully watched.

128. (*g.*) *Arsenical preparations* have been recommended for the more chronic states of rheumatism, by JENKINSON and others. Dr. BARDSLEY considered them to be of essential service in these states of the disease when conjoined with opium. I have recently given, in a very few instances, the combination of the iodide of arsenic and mercury — the liquor iodidi arsenici et hydrargyri as prepared in DONOVAN's solution, both with and without opium; and in these this solution appeared of service; but it requires a further trial before a decided opinion as to its merits in this disease can be given.

129. (*h.*) *Naphtha* was prescribed for chronic rheumatism by THOMANN; and several forms of *bitumen*, *rock-oil*, or *Barbadoes tar*, or *petroleum*, have also been employed, most frequently as popular remedies. The petroleum is used both internally, as a sudorific, in doses of from ten minims to half a drachm, three or four times daily, and externally as a liniment or embrocation. The substance called *British oil*, procured by distillation from the stone-coal of Shropshire and Wales, and the empyreumatic oil obtained during the formation of coal gas, are also popular remedies for this complaint. Of these I have had no experience, but I have seen very decided benefit produced by the use of *tar-water*, and of the Norwegian *tar*, this latter being taken in the form of pill with liquorice-root powder and magnesia. The exaggerated accounts of the virtues of tar and tar-water, which appeared at the commencement of the last century, and the ridicule to which the use of it was soon afterwards subjected, have led to the disuse of a substance which is calculated to produce very salutary effects when judiciously employed, not only in chronic rheumatism, but also in several chronic and cachectic diseases.

130. (*i.*) Besides the cod-liver and empyreumatic oils just mentioned, several *vegetable* or *essential oils* have been recommended by writers, both internally and externally, for rheumatism. I need not here add to what I have already stated in favour of *turpentine*. It was many years ago praised by KOELER and myself as an internal and external remedy for this disease; and the *cajeput oil*, much used in the East, and brought to the notice of European physicians, is often a useful adjunct to turpentine, especially in the external use of this latter substance. It should not be overlooked that *olive oil* was recommended both internally and externally for chronic rheumatism by BROCKLESBURY; and, when taken frequently, or in sufficient quantity, and so as to preserve a regular state of the intestinal secretions and excretions, it is certainly of considerable service.

131. (*k.*) *Sulphur* has long been employed as a popular remedy in both the active and passive states of chronic rheumatism, although it has been overlooked by writers with reference to this complaint. The precipitated sulphur may be taken nightly, either alone, or with the carbonate of magnesia, this combination being preferred when, with a dry or harsh state of the skin, there is fla-

tulence or acidity of the prima via. It exerts a very decided effect upon the functions of the skin, both promoting and altering the excretions from this surface — an intention of the greatest importance in the chronic and sub-acute forms of this complaint. I have usually prescribed the following every night, exhibiting occasionally, or once in the week, a purgative draught in the morning, consisting either of the compound decoction of aloes, or of equal parts of the compound infusions of senna and gentian with sulphate of magnesia, &c.

No. 334. ℞. Sulphuris præcipit. ʒvj; Magnesiæ Carbon. ℥ss; Pulv. Rad. Glycyrrh. ʒjss; Pulv. Zingiberis ʒj. Misce. Capiat æger cochl. j vel ij minima, in aquæ vel lactis pauxillo, omni nocte.

132. iv. OF VARIOUS OTHER MEDICINES WHICH HAVE BEEN ADVISED FOR THE SEVERAL FORMS OF RHEUMATISM. — Having noticed the plans and means of cure most appropriate to the principal forms of rheumatism respectively, I shall briefly mention some others which have been employed more indiscriminately, especially by some writers; and remark upon their application to certain states of the complaint, *before I proceed to notice those external measures and regimenal means which have, at sundry times and by numerous authors, been recommended to the profession and the public.*

133. (*a.*) *Of purgatives*, little mention may be here made beyond what has been stated when treating of acute rheumatism (§ 102.). This class of medicines was much employed in the several forms of the disease by RIVERIUS and BUCHHAVE, and in the bilious complications by STOLL and others. They are certainly required in all circumstances, especially early in an attack; but only to the extent of completely evacuating all fæcal accumulations, and morbid secretions and excretions, and of preserving and promoting a free discharge of these. If employed beyond this intention, they may reduce vital power and resistance, without producing any beneficial effect on the disease in any of its forms. The choice of purgatives and aperients in this complaint is always a matter of importance. I have already remarked on this topic (§ 102.), but I may here add, that the stomachic, warm, or cardiac, should be preferred, and that these may be conjoined with alkalies or other deobstruents.

134. (*b.*) *Emetic tartar* was much employed in small doses by BROCKLESBURY, and much more recently by BALFOUR, in all the forms of the complaint; but it has most commonly been conjoined with opium or with other diaphoretics. Unless James's powder, it is the only preparation of antimony on which reliance should be placed in this complaint. It is most appropriate in hot, dry, or harsh states of the skin; when the pulse is tolerably strong and full, and when the cutaneous excretion has been suddenly suppressed; but attempts at the restoration of this excretion should be made by other diaphoretics, when constitutional power is much depressed, and the pulse is very rapid or compressible, more especially by the liquor ammoniæ acetatis, with excess of ammonia, with camphor, and with the spiritus ætheris nitrici in full doses.

135. (*c.*) Various *narcotics* and *sedatives*, besides those already noticed, have been advised for the several forms of rheumatism. Of the preparations of *opium*, *morphia*, &c., as well as those of *colchicum*, I may here remark, that they should rarely be confided in alone, or given, unless in such combinations as will promote their excreting operations — the former by the skin, the latter by the intestines and kidneys, — and at the same time prevent, especially as regards colchicum, their depressing influence on the nervous system, the combination with ammonia being one of the best which can be employed. In chronic forms of rheumatism, the preparations of colchicum are productive only of temporary benefit, and are often prejudicial, unless conjoined with cinchona, or quina, or with guaiacum, or with camphor or alkalies. *Aconite* is most appropriate to the more acute states of the disease, and to certain complications about to be noticed. *Conium*, which was praised by STORACK, has comparatively little influence, unless continued in considerable doses. It is most serviceable in the forms of rheumatism which occur in females, and which are consequent upon suppression, interruption, or difficulty of the catamenia; and in these circumstances the *stramonium*, and even *digitalis*, are often of service, especially when conjoined with aloetic aperients, or with the iodide of iron, or with the biborate of soda, or with capsicum, according to the peculiarities of the case.

136. (*d.*) Several *stimulants* have been advised for the more chronic states of the disease. — α. *Phosphorus* was recommended by BUCHNER and HUFELAND; but it is a too hazardous medicine to deserve adoption unless with great caution. The phosphoric acid, which may be employed with safety, has not been hitherto prescribed for this complaint. Probably neither this acid, nor the mineral acids, may be appropriate in rheumatic cases, unless in as far as they may promote the digestive and primary assimilative functions, and may thereby prevent the generation of the lactic and uric acids. — β. *Assafœtida* was praised by THEDEN in the chronic states of the disease; and certainly both it and several other of the *gum-resins* and *balsams* are not devoid of efficacy in these states, especially when used as adjuncts to other appropriate means. I have prescribed the *Peruvian balsam* in some instances with very decided success. — γ. *Mezereon* has been employed by some writers; but it is in combination with *sarza* and *sassafras* and *guaiacum*, as in the compound decoction of sarza that it is most serviceable. — δ. The *geum urbanum* has been recommended by BUCHHAVE; the *solanum dulcamara* by LINNÆUS, PRESSAVIN, and VIEUSSEUX; and the bark of the *magnolia glauca*, which is tonic and aromatic, by BARTON. An infusion of either of these may be made the vehicle of other medicines, may promote the cutaneous functions, and, by this operation, as well as by their stimulant and tonic action on the organic nervous system, may remove attacks of the disease. — ε. The *trifolium fibrinum* was praised by ASKIEM and BROCKLESBY in the form of infusion, with the volatile tincture of guaiacum. — ζ. The *Phytolacca decandra* was prescribed by BARTON. My friend Professor DUNGLISON remarks, that it is celebrated as a remedy for chronic rheumatism, and is given in the form of tincture of the ripe berries. An infusion and an extract of the leaves of the *Taxus baccata*, or yew tree, have been given in this complaint, but I am not acquainted with the results. — η. The powder or extract of *nux vomica* has

been recommended by OBERTEUFFER in chronic rheumatism, and for the removal of the stiffness and partial palsy of the limbs often attending the complaint. I have tried the alcoholic extract in a few instances, in doses of a quarter of a grain increased to a grain, twice or thrice daily, preferring it to strychnine. It will be found of service in very chronic cases, when aided by other means; but it is apt to produce headache, which, however, may sometimes be prevented by conjoining it with aperients, as the purified extract of aloes, soap, and the ox-gall.—*Capsicum*, or Cayenne pepper, was praised by ADAIR. It is the common resource of many of the dark races, especially the Negro, in all the chronic and sub-acute states of rheumatism; and, whilst they use it abundantly internally, they apply it externally over the pained part. I have frequently had recourse to it; but chiefly as an adjunct to other means, and it has in this way always appeared to be of service.—*Mustard seed* has also been given by ADAIR. About 1825 it was an almost universal popular medicine, not only for rheumatism, but for all diseases. It soon, however, fell into disuse; most probably because it really possessed some claims to attention in chronic rheumatism.*—The *æthers* and *ætherial preparations* have been prescribed for the several forms of rheumatism, but chiefly as adjuncts to other means; and probably *chloroform* will soon be added to the list of means available in the more acute or neuralgic states of this complaint, and be exhibited either by the mouth or by inhalation, the former being obviously the safest method.

137. v. OF VARIOUS EXTERNAL MEANS RECOMMENDED BY WRITERS.— All external means of cure, unless employed as adjuvants of internal remedies, and judiciously prescribed, are attended, either immediately or remotely, by more or less risk. Rheumatism, in all its forms, is an external manifestation of a constitutional malady, in which the organic nervous and vascular systems and blood are chiefly affected; and if this manifestation be suppressed in one quarter, before the evil is removed in the systems more especially implicated, it will most assuredly appear in some other quarter, and not improbably in some important or vital organ. External means, excepting such as promote the depurating functions of the skin, ought therefore never to be resorted to unless in aid of, and contemporaneously with, or consecutively of, appropriate internal or constitutional treatment.

138. (*a.*) Of the numerous external means and applications which have been recommended for the different varieties of this disease, the *selection* is most difficult; and it should be guided entirely by the peculiarities and duration of the attack. The number of these means, although not so great as that of internal remedies, is almost sufficient to distract the inexperienced when an attempt is made to employ them appropriately to the circumstances of the case. Yet will a due knowledge and recognition of these circumstances and peculiarities prove the best guides to the selection of them, and to the periods of having recourse to them, this knowledge constituting the best kind of experience; for without it experience is only gross empiricism. The enumeration of this class of means may, in itself, appear somewhat formidable; but it will furnish, with the remarks which I shall append to each, an imperfect guide, upon which the reflecting practitioner will make the required improvements when he comes to apply them to practice.

139. (*b.*) *Acrid topical applications* of various kinds, and *irritating plasters*, have been employed empirically as domestic means, and prescribed professionally. LENTIN and others have recommended them; but BANG, the very practical writer of Copenhagen, considers them not devoid of risk, unless they are prescribed in aid of judicious internal remedies. Sinapisms, the moistened bark of the mezereon, and various similar applications have been resorted to, and often with benefit, *when vital energy is duly supported, and when the excreting functions are promoted at the same time*—a principle of cure which ought never to be overlooked in the treatment of diseases caused by depressing causes, and attended by pain and impaired power, as well as by morbid states of the circulating fluids.

140. (*c.*) *Acupuncture*, or the gradual introduction of a sharp and fine needle or metallic wire through the integuments down to the seat of the complaint, in very painful cases of muscular or aponeurotic rheumatism, has been practised for many ages in the far East, especially in Japan and China. It was treated of, and the safety of the practice shown, as well as the temporary efficacy of it, by Mr. CHURCHILL; and it was also frequently employed in France. I have seen it resorted to in several instances with some success; but I am not aware of much permanent benefit having been produced by it. The practice has fallen into its deserved disuse.

141. (*d.*) *Artificial eruptions* have been resorted to in rheumatism, more especially in chronic and sub-acute cases, by THILENIUS, LENTIN, PIDERIT, VICAT, ANTENRIETH, and JENNER; and emetic tartar, added to an ointment or plaster, has been commonly used to produce these eruptions, which, however, especially when plasters have been employed and allowed to remain too long, or when the constitution has been cachectic, has sometimes been followed by foul, spreading, and obstinate ulcers. If resorted to at all, they should be watched; and they ought not to be produced immediately over a joint, although they may be brought out in the vicinity, in obstinate cases. I tried them many years ago in dispensary practice, in several internal complications of rheumatism, with but little or doubtful advantage.

142. (*e.*) *Baths, warm, vapour*, and *medicated*, have been long recommended for the more chronic cases of the disease. Of thermal mineral baths mention will be made hereafter, but considerable advantage will often be derived from warm baths, which may be prepared at any place, under due direction; and which may be general or local, according to the peculiarities of the case. *Warm*

* A credulous disposition to believe in quackeries of some kind or other—religious, political, and medical—is inseparable from the English character; and the more absurd the doctrine, the more ridiculous the means, the more gross the humbug and imposture, the more credence such impositions acquire, and the more generally are they adopted, not by the ignorant only, but by the elevated in rank and social position more especially. The public resemble a flock of sheep, of which, when one breaks off in an eccentric direction, all run the same way. A facetious contemporary would be inclined to impute this tendency to the quantity of mutton annually devoured by our countrymen.

baths, at a high temperature, or *vapour baths*, are generally most beneficial in chronic, passive, or cold states of the complaint, and for these the addition of salt or mustard, or both to the warm bath, whether general or local, will be of service. Even when *sea water* is used for a warm bath these additions are often of service, especially when the regimen and internal treatment is judicious. But baths are not confined to chronic cases only. Even in the sub-acute and acute states benefit will be derived from warm baths of a somewhat lower temperature, or tepid baths, containing an *alkali*, or *alkaline sub-carbonate*. Indeed *warm alkaline baths* will be found useful in both states of the disease, and more particularly when the skin is hot, dry, and harsh, during the evening and early part of the night.—*Vapour-baths*, both general and local, have been much recommended by Du Moulin, Bardsley, and Blegborough, and their efficacy is undoubted in chronic cases, especially when the joints are affected, and when aided by a restorative treatment and regimen, and due exercise in the open air.—*Sulphur baths* have been employed with marked benefit in similar cases; and warm baths containing the sulphuret of potash have also been resorted to. These baths, general or local, or in whatever way they may be *medicated*, should be employed chiefly in aid of judicious internal treatment, and of a proper regimen.

143. (*f.*) The *warm douche* and *vapour applied locally*, have been found of service in many cases; but the remarks just offered are equally applicable to the use of these. To obtain advantage from them, they ought to be daily employed, to be followed by friction, exercise, and warm clothing, and accompanied by the internal treatment recommended above.

144. (*g.*) *Blisters* have been generally employed as external or local aids of constitutional means; but unless these latter means are appropriate, the benefit derived from blisters is only temporary. Fowler, Rouppe, and others, have advised them; but Hufeland, finding the advantage procured from them by no means permanent, recommended them to be kept open by the substances usually employed for this purpo-e. Blisters are seldom of use early in acute attacks; they are most useful towards the decline of the disease, and when the action of the several emunctories has been duly promoted. They are more beneficial in sub-acute cases, and when the joints are affected; but they should not be employed immediately over superficial joints, but only near to them. The repeated application of blisters is generally preferable to keeping them open.

145. (*h.*) *Embrocations, liniments*, and *rubefacients* of various kinds have been employed, both empirically and with rational intentions, as aids in the cure of the several forms of rheumatism. They have been even resorted to as the only means, and often as popular remedies and without medical advice. Several nostrums are employed in the form of embrocation or liniment; and, although relief has often been procured by them, yet their inappropriate use, and the application of them whilst the morbid conditions of the nervous and vascular systems remained unabated, have been followed in some cases by dangerous and even fatal consequences, — by internal complications, or by the supervention of disease of internal surfaces or organs, with effusions or adhesions. A few instances of these results have come under my observation, and have demonstrated the danger of having recourse to means which may suppress the local manifestation of a constitutional evil, without having prescribed judicious internal remedies for that evil, and without having employed agents calculated to throw off or to resist the tendency to internal complications. It would be endless, and of doubtful advantage, to enumerate the various embrocations, liniments, and rubefacients which have been praised for the several forms of the complaint. Most of the *formulæ* comprised under the head *Linimenta*, in the Appendix (*Form.* 295—314.), may be used also as embrocations and rubefacients in this disease with great advantage, when a judicious internal treatment has preceded, or accompanies, the use of them. Under such circumstances warm *rubefacient poultices*, and *rubefacient plasters* will also be found of service, more especially in chronic cases.

146. (*i.*) *Frictions, shampooing, percussion*, and *flagellation*, have been much employed in the more chronic and obstinate states of the complaint; but these means, especially frictions and shampooing, are most serviceable after warm salt-water or medicated baths. The frictions may be only simple, as with the hand, or with sweet oil, or with variously prepared oils or liniments, or with the hard Indian glove, or with the hair brush, or with any of the liniments prescribed in the Appendix. *Percussion* not infrequently relieves for a time the chronic pains of muscular or aponeurotic parts; and *flagellation* may have a similar effect; but it has been little used since the practice of medicine was rescued from the hands of monks in the dark ages, although it was employed by the ancients.

147. (*k.*) *Galvanism* and *electricity* have had numerous advocates in the chronic forms of rheumatism; and they are sometimes of service, especially *electro-magnetism* in the more passive states of the chronic disease. Several recent writers have furnished evidence in favour of the use of magnetic electricity in these forms of the complaint; but I am unable to give an opinion respecting it from my own experience. I have, however, seen benefit derived, in a few instances, from Galvanic electricity.

148. (*l.*) *Insolation*, or exposure of parts affected with chronic rheumatism to the sun's rays, has been advised; and I have prescribed it with benefit in the passive or cold form of the complaint. The effect probably depends not merely upon the warmth thereby produced, but also upon the electrical agency of the sun's rays. Much of the benefit derived from migrating to a warm climate in cases of obstinate rheumatism arises from this cause; but the change should be made to a dry climate and a clear atmosphere; for if the situation abounds in humidity or malaria, however warm it may be, the rheumatism will still continue, or even be aggravated.

149. (*m.*) *Issues* and *setons* have been mentioned favourably by some of the writers who have recommended the production of artificial eruptions for this complaint. They are rarely required, or submitted to, in cases of simple chronic rheumatism; but I have prescribed them with marked advantage in certain of the complications, or internal extensions, of the disease, more especially during, or subsequent to, rheumatic endocarditis

or pericarditis; or when the spinal membranes have become affected. They are also of use in sciatica, and when the large joints are implicated, and in these cases they have been recommended by Barnsley; but they should be prescribed in a suitable situation, so as to produce a derivation from the part or joint itself, and yet not be far removed from it. Two or even three issues may be required in some cases.

150. (n.) *Moxas* have been recommended, from the most remote times in the far East, for chronic rheumatism, especially when seated in the joints; and they have been praised by Thilenius, Beer, Pascal, Naudau, and more recently by Larrey, Dunglison, and Boyle. They are often of service when applied in the situations advised for issues, and when a puriform discharge from the parts cauterized by them is obtained. They, as well as issues and setons, are suitable to the more chronic cases, or rather to the effects of rheumatism, than to recent attacks.

151. (o.) *Mineral waters* and *mineral baths* are amongst the most beneficial and popular remedies for the several states of chronic rheumatism. Much of the benefit derived is, however, due to the change of climate, air, scene and occupation consequent upon visiting watering places. The natural thermal springs have been most generally recommended for the more chronic and obstinate states of chronic rheumatism, and for sciatica, especially those of Bath and Buxton in this country; of Wishaden, Baden-Baden, Karlsbad, &c. in Germany; of Bareges, in France; and of several in Italy. The chemical composition and temperature of these several springs, will suggest the propriety of having recourse to them in the circumstances of each case; and it is chiefly with a strict reference of this composition to the peculiarities of individual cases, that a selection of both thermal springs and of other mineral waters should be made. Much information will, however, be obtained on this topic from the writings of Falconer and Barlow on the Bath waters; from those of Robertson and Scudamore on the waters of Buxton; from those of Granville, Osann, Lee, and Gairdner, on the German thermal springs; and from Carmichael's account of the water of Bareges and Bagneres de Bigorres. Not only may these waters be taken internally, but they are still more beneficial when used as general or local baths, or in the form of douche. The duration of these baths should depend upon the strength of the patient. It should be short at first, and prolonged with repetition; but benefit will seldom be derived until a number of baths have been taken. The circumstances of the case should, however, suggest both the duration and the frequency of them. The same remark applies to the use of the douche. Immediately after the bath or the douche, the surface should be rubbed with dry hot towels; and the patient wrapped up in flannel or in blankets, so as to promote, for several hours, a copious perspiration. The use of warm chalebeate baths in chronic states of the complaint was much insisted upon by Brandis; of the waters of Rehburgh by Albers; of sulphureous waters and baths by many writers; and of numerous mineral springs by authorities of every kind, some of which will be found in the *Bibliography*.

152. (p.) A form of *physical training* has lately come into vogue for chronic rheumatism and other chronic ailments, more especially such as result from dissipation, excesses, irregularities, &c. of various kinds; and this training, conjoined with change of air, occupation, scene, and mode of living, forming part of the system, and with bathing, the copious use of diluents and exercise, so as to produce a very free cutaneous discharge, is often productive of marked benefit, which is the more striking in those obstinate cases — which have often become obstinate from the fault and neglect of the patient, and from recourse having been had to many physicians in succession without allowing any one of them time or opportunity to employ the salutary resources of science. What, however, is denied the honest advice of a physician, is readily accorded by the patient to the confident humbug of the charlatan, especially when it is sought for at a distance, and acquired at an expence which is felt as a recommendation, although the only one. Regular modes of living, active and regular exercise, temperance, and a copious use of diluents, a free excretion from the skin, procured by baths, diluents and exercise, and change of air, of occupation and of scene, have been recommended by physicians in all ages for many chronic complaints; but they have generally been imperfectly followed out, or partially adopted, or altogether neglected, by those for whom they were prescribed. When, however, they were ushered to the public, sane and insane, as the results of inspiration; were surrounded by appliances calculated to excite the senses of the weak-minded, to attract the credulous, to allure the idle, the frivolous, and the intriguing, and to strike those whose consciousness reach but little further than their sensations, and who are incapable of observing and of reasoning on facts and occurrences; and when they were moulded into a plan, and popularized under the name of "*water-cure;*" and were thus recommended by every means of publicity to that largest class of the community now specified as an universal remedy, beyond all remedies the most efficacious, then were the results such as might have been anticipated by the philosophic observer of human nature, and of the constitution of the human mind as influenced by existing states of society. The most remote of these results already appear in a more accurate estimation of this universal "cure," and in the recognition of the fact, that of all the "vanities under the sun," the greatest and the shortest lived are those by which charlatans gull the public, and jeopardise not only the lives of the credulous, the thoughtless, and the worthless, but also the most important interests of families.

153. (q.) *Sulphur*, in the form of sulphur fumigation, the oil of sulphur of former times, and the *carburet of sulphur*, have been locally or externally employed for the more obstinate forms of this disease. Otto, of Copenhagen, recommends, either alone or in conjunction with vapour baths, two drachms of carburet of sulphur in half an ounce of rectified spirit of wine, four drops of which are to be taken internally every two or three hours, and the parts affected to be rubbed with a liniment consisting of two drachms of this carburet and half an ounce of olive oil. This treatment is most suitable to those cases in which the secretions and excretions have been duly improved and pre-

moted by the appropriate means before it is entered upon.

154. (r.) *Urtication*, or stinging, or flagellation with nettles, has been advised for chronic rheumatism as well as for some forms of palsy, by many of the older writers; and it has in more recent times been prescribed by HUFELAND. It may be resorted to with advantage after warm or vapour baths; or in similar circumstances to those in which other rubefacients and external derivatives have been recommended, as warm terebinthinate embrocations, &c.

155. vi. TREATMENT OF THE COMPLICATIONS OF RHEUMATISM. — *A.* It has been stated above that acute rheumatism may extend to the *membranes of the brain*, the disease either continuing in its more external seats, or subsiding in, or disappearing from these (see §§ 50 and 51.). When head symptoms occur in the course of acute or subacute rheumatism, the chief object is first to ascertain the cause and nature of this complication; to determine in how far it may be caused by the treatment; and to observe the evidence for or against the existence of inflammatory action in the membranes, or of simple nervous disturbance, or of a combination of both. Delirium, if slight, wandering, and nocturnal, the external disease continuing but little or not at all ameliorated, may arise from the narcotics prescribed, or from too lowering or depressing agents, or from the exacerbation of the fever (see § 50.); and in these circumstances the indications are obvious. Violent or distracting pain in the head may also depend on the same causes, and be removed by similar means to those which these indications suggest, or by such as are prescribed for this form of headach at at another place. (See Art. HEADACHE, §§ 50, *et seq.*) But when the head-affection appears to be dependent chiefly upon inflammatory action in the membranes, then the subsidence of the external disease, especially that of the joint, will indicate its nature and the danger of effusion. In these circumstances, whilst active revulsion or derivation should be attempted by sinapisms applied to the parts affected previously, local depletions should be ordered, and be followed by blisters on the nape of the neck and occiput, or behind the ears. Calomel and antimony, purgatives and terebinthinate enemata ought also to be administered; and if somnolency or sopor, or coma be threatened, the head should be shaved and surrounded by a cloth which has been just soaked in spirit of turpentine, or which is imbued with an embrocation consisting of equal parts of the terebinthinate and compound camphor liniments.

156. *B. The complications with the several forms of cardiac and pericardiac inflammations and their consequences* are the most frequently met with in practice (§§ 48 and 49.). The nature and treatment of these complications have been so fully discussed when treating of diseases of the heart, that I have left nothing to add respecting them at this place. I may however remark, that further experience has proved the accuracy of the opinions I then stated; and the propriety of employing the means of cure there advised. Rheumatic endocarditis and pericarditis, so common in children and young subjects, especially in cold, humid, and variable climates, depend chiefly upon the fashions in clothing; upon low, damp, and ill-ventilated places of abode; upon modes of living; and more especially upon the unnatural practice of hardening children by exposure and by fashions in dress. Hence the necessity of avoiding these causes, and of pursuing a treatment calculated to diminish or remove morbid effusion or change of structure, and at the same time to improve the constitution of the blood, and to promote vital action and constitutional powers — objects which may be attained, when these complications occur in young subjects; although they may be only partially or contingently accomplished in older subjects. (See *Treatment of Rheumatic Endocarditis and Pericarditis*, in Art. HEART and PERICARDIUM, § 144. *et seq.*)

157. It is not unusual to meet with cases, in which this complication has occurred in early life, or has appeared at some previous period, the acute rheumatic attack having been entirely removed, but the cardiac or pericardiac affection continuing either with or without detection. In some cases which have come under my observations, for very many years after the rheumatic fever, complicated as now stated, had occurred, and even after every rheumatic symptom had disappeared, little or no ailment had been experienced, until shortness of breath on exertion, or dropsical effusion evinced the mischief produced in the heart. In other cases, however, attacks of acute or sub-acute, or chronic rheumatism, have followed at periods more or less remote from that attack in which this complication first appeared, generally aggravating the cardiac or pericardiac lesion, but not having always this effect; for I have met with instances, one of them in a medical man, in which an attack even of acute rheumatism has not increased the organic disease of the heart which had taken place during a previous seizure.

158. A reference to the histories of cases of this complication, which have come under my care in the course of a practice of thirty years, and of which I have preserved notes, suggests their classification as follows: — 1st. Cases in which rheumatic fever complicated with cardiac disease had been experienced in early life, but many years had passed without any ailment having been experienced until shortness of breathing on exertion and dropsy ultimately supervened, the patient dying of the cardiac disease, no second attack of rheumatism having occurred. In a case now under my care, twenty-three years elapsed between the rheumatic fever thus complicated and the present developed state of the organic disease of the heart, no rheumatic disease or other ailment having been experienced during all these years, although the cardiac affection had been slowly progressing until it has reached its present state.—2d. Some years after the occurrence of this complication, the cardiac disease still existing, latent or detected, another attack of acute rheumatism has supervened, and has aggravated the cardiac complication, or even diminished the physical signs and symptoms of this complication, these different effects depending much upon the treatment and constitution of the patient. I have thus seen two attacks of rheumatic fever take place after intervals of years; the cardiac complication at last destroying the patient. In the case of a medical man, two such attacks, after intervals of some years, have left the cardiac disease, in respect of both the physical signs and the symptoms, much less extensive and severe than when I first saw him, fifteen years

ago. — 3d. Much more frequently the patient who has experienced an attack of cardiac disease in the course of, or consequent upon, rheumatic fever, has suffered recurrences of the rheumatic affection in a slight or chronic form, without any very manifest aggravation of the cardiac disease, which, however, has either slowly advanced, or has proceeded more or less rapidly according to his habits, modes of living, constitution, and treatment. — 4th. In several instances, rheumatic fever has occurred in early life, accompanied or followed by a cardiac complication, and no second attack of rheumatism has appeared, or merely slight or chronic rheumatic affection; but the cardiac symptoms, as well as the physical signs of cardiac disease, have gradually subsided until they have, after several years, nearly altogether disappeared, or have been attended by little inconvenience.

159. It is obvious that, in these several states of complication, the exact nature and extent and consequences of the cardiac and pericardiac lesions, demand the chief attention; and that the treatment of whatever rheumatic affection may be present should be a secondary object. Fortunately, however, the very means in which I have for many years confided in for the several forms of rheumatism, are also such as are most serviceable in the cardiac lesions most commonly associated with them. After what I have stated, when treating of diseases of the HEART and PERICARDIUM (see §§ 144. *et seq.*), I need only enumerate some of the most efficient means which may be prescribed in these complications, and which moderate powers of observation will enable the physician to apply to the peculiarities of particular cases. Upon the approach, or in the early stage of the cardiac complication, *calomel* with *opium*, or with *aconite*; or the tincture or extract of aconite with *biborate of soda* or with *alkalies*; spirits of *turpentine* given by the mouth; alkaline *aperients* with *colchicum*; *camphor* with *digitalis* and *henbane*; the *alkalies* in large doses with demulcents and diluents, and external revulsion, are most efficacious in preventing the deposition of lymph or fibrine, and the effusion of fluid. At an advanced stage, when either fibrinous lymph, or serous fluid, has been effused, or when hypertrophy has followed obstructive or other changes of the valves and orifices of the heart, then the *iodides* of mercury or potash; *borax* in camphor mixture; the *iodide of potassium* and the solution, or carbonate, of *potash*, with the compound decoction of *sarza*, or the decoction of *senega* and an aromatic water; *camphor* with *digitalis*, and with either of these decoctions, or with the infusion or tincture of hops; the *iodide of iron* in the syrup of sarza; and an issue or seton near the margin of the ribs, are the means in which I have most confided.

160. *C.* When *the membranes of the spinal chord* are affected (§§ 52, 53.), the treatment should depend much upon the duration of the disease in this situation. If the patient be seen early, local depletion, chiefly by cupping, followed by calomel and opium with colchicum; by purgatives and terebinthinate enemata; by terebinthinate embrocations in the course of the spine, and by blisters, are most serviceable. If the case come under treatment at a more advanced period, or if the above means have failed, partial palsy or paraplegia, or other symptoms of increasing congestion, effusion of lymph or pressure on the chord appearing, issues or setons in the back or loins; the bichloride of mercury, or the iodide of potassium, in the decoction of sarza, and the other means advised in the articles on PALSY and SPINAL CHORD, will then be appropriate.

161. *D.* When the *diaphragm*, or either its *pleural or peritoneal surfaces* are implicated, or when the costal *pleura*, or the *peritoneum* (§§ 54, 55, 56.) reflected over the abdominal parietes, is attacked, the lymph thrown out soon excites inflammatory action in the opposite parts of these membranes, and agglutination of the surfaces soon follows. This complication not infrequently came under my notice many years ago in public institutions, the affection of these surfaces having been an extension of disease from the adjoining parts, the tenderness and pain of which often masked the more internal mischief. When, however, the diaphragm is implicated, the symptoms of diaphragmitis are generally present in a very manifest form (see Art. DIAPHRAGM, § 9. *et seq.*). In these associations of the disease, the means already advised, especially local depletions, calomel, colchicum, and opium; terebinthinate embrocations, blisters, issues, &c., and various other means recommended in the articles on inflammations of these surfaces and on their consequences, may be resorted to. In many instances, these forms of disease are not brought before the physician until they have arrived at advanced or chronic states — until effusion, adhesion, &c. have taken place; and then a judicious and persevering treatment will be required to produce any amelioration, aided by change of air, by suitable diet, and by whatever may promote the general health and constitutional power. In many cases, however, the iodides already mentioned, taken in suitable vehicles; bichloride of mercury in small doses with sarza; alkaline solutions with iodides; Plummer's pill, with soap and taraxacum; repeated applications of the terebinthinate embrocation; repeated blisters, and issues, when aided by proper regimen, will be productive of some benefit. These external means are more efficacious than the application of the tartar-emetic ointment, which I have not found of much service in these cases.

162. *E.* The *association of affections of the sexual organs with rheumatism*, or the supervention of the former upon the latter (§ 57.), requires means adapted to the states of sexual disorder, such disorders being duly considered under their respective heads. But, in respect of these, as of other associations of internal disease with rheumatism, it should not be overlooked, that it is not only such internal disease which requires appropriate treatment, but also the rheumatic diathesis — the constitutional affection, whether depending upon or seated in the organic nervous system, or in the blood, or in both, — and to this diathesis, and to the conditions constituting and indicating it, our means of cure should also be directed; using means calculated to support the vital power of this system, and to remove the morbid conditions of the blood — objects which are more certainly attained by the remedies I have advised for the treatment of rheumatism, than by any other. Rheumatism in females being so frequently connected with suppression, or irregularity, or difficulty, or the cessation of the catamenia, or with leucorrhœal

affections, due attention in the treatment should therefore be devoted to these disorders.

163. *F. Gonorrhœal Rheumatism*, or the states of rheumatism consequent upon gonorrhœa (§ 44. *et seq.*), is one of the most difficult to remove. A severe case of it occurred in my practice very lately, and presented the mixed form of capsular and aponeurotic rheumatism, the knees, and limbs generally, having been severely affected. The iodide of potassium and solution of potash, in the decoction of bark, or in the guaiacum mixture, and frequently with colchicum, were the medicines chiefly prescribed. The case proceeded favourably, and after a few weeks the patient was able to have change of air, and to take regular walking exercise. In more obstinate cases, I have given the spirit of turpentine internally until the urinary organs were affected with success; or bark with alkalies and the iodide of potassium, whilst terebinthinate epithems, or blisters, were applied on or near to the affected joints. In this form of the disease, a full dose of calomel, colchicum, and opium, taken at night, and a draught with castor oil and spirit of turpentine the following morning, in addition to these means, and repeated at intervals of one, two, or three days, will generally be of great service. I have seen the tinctura lyttæ, and capsicum, given with the medicines now mentioned, until some degree of irritation was produced in the urinary organs by the former, and until heat or smarting at the anus followed the latter, prove most beneficial in this form of the complaint. If the affection of the joints become chronic, the internal use of the iodides, and the repeated application of blisters, or the formation of issues near the joints, and recourse to thermal springs, are amongst the most efficacious means of cure. If this form of the disease be neglected at an early stage and becomes chronic, it is not only removed with the greatest difficulty, but organic lesion of the joint is very apt to supervene.

164. *G. Rheumatism is often associated with influenza or catarrhal fever*, or *with ague*, or *with a remittent form of fever*, and I have already shown that the complication is due chiefly to the presence of malaria in the humid and cold air to which the patient has been exposed, or to his having previously been the subject of ague (§ 58.). In cases of either of these associations, the treatment which I have recommended for the rheumatic affection is equally appropriate to the associated disorder, the lowering means too frequently prescribed for the former aggravating not only it, but also the complication, and favouring the supervention of still more serious internal disease, especially of the fibro-serous, or serous surfaces.

165. *H.* If *Pneumonia* or *pleuro-pneumonia* supervene in the course of acute rheumatism, a moderate general or local vascular depletion will be prescribed with advantage, if the patient be strong or plethoric; and calomel or antimonials with opium, and saline diaphoretics, will generally be required. Blisters will also be of service. In a case, which was under my care, caused by removal in an unfavourable state of weather and season, into a damp house, rheumatism, in a subacute form, disappeared from the arm after two doses of the wine of colchicum of ten drops each had been taken, and was immediately followed by asthenic pneumonia with rusty expectoration. A small cupping on the chest (seven ounces), and camphor with ammonia, small doses of the decoction of senega and terebinthinate rubefacients, and due attention to the several secretions and excretions, especially to those from the skin and kidneys, were soon followed by recovery. Pneumonia and pleuro-pneumonia associated with, or consequent upon rheumatism, have but rarely come under my observation; and the association of *scurvy* with rheumatism is not more frequent, although these complications appear to have been of more common occurrence during the early part of the last century, according to the best practical writers on medicine in that period. More recently *lemon-juice*, which has been found so beneficial for the prevention and cure of scurvy, has been said to have been serviceable in rheumatism, but I have had no experience of it in this latter complaint.

166. vii. REGIMEN, DIET, AND CHANGE OF AIR. — There are few diseases which require greater attention to these than rheumatism. During an attack of the acute form of the disease, the *regimen* and *diet* should be antiphlogistic. Such articles as are the least likely to occasion acidity should alone be taken. Saccharine substances ought to be avoided. As soon as convalescence has proceeded sufficiently far to admit of removal, *change of air* should be recommended,—more particularly to a mild or warm and dry air, or to a place where warm salt-water baths may be procured, or thermal springs may be used, especially to Bath or Buxton. If the attack has not been complicated with, or followed by, any affection of the heart, regular and active exercise in the open air ought to be taken, as soon as the patient is able, so as to preserve a free excretion from the skin. If any cardiac affection is present, an issue should be kept freely discharging near the margins of the ribs. In more chronic or mild cases, the regimen and diet ought to be regulated according to the peculiarities of individual cases; but, in every instance, change of air, active exercise in the open air, when it can be taken without detriment to the affected part; flannel clothing nearest to the skin; a diet regulated conformably with the state of the complaint; and due regulation and promotion of the several secretions and excretions, are most important aids to a permanent recovery, and to the prevention of a future attack.

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RICKETS. — SYNON. — *Rhachitis* (from ῥαχις, the spine, or ῥαχιτης, spinal), Glisson; — *Rachitis*, Sauvages, Vogel, Boerhaave, Cullen; — *Tabes Pituitosa, Morbus Anglicus, Osteomalacia, Mollities ossium, Osteosarcosis*, Auct.; — *Innutritio ossium*, Darwin; — *Osteomalakia*, Swediaur; — *Scrofula rhachitis*, Young; — *Cyrtosis rhachia*, Good; — *Tabes pectoris, Spina nodosa, Rachitismus*; — *Rachite, Rachitisme, Riquets*, Fr.; — *Englische krankheit*, Germ.; — *Rachitide*, Ital.; — *Rickets, softening of the bones.*

CLASSIF. — *Class* 3d. Cachectic diseases; — *Order* 2d. Swellings (Cullen). — *Class* 5th. Diseases of the Excernent Function. — *Order* 1st. Affecting the Parenchyma (Good). IV. CLASS. IV. ORDER. (*Author.*)

1. DEFIN. — *Softening and curvature especially of the long bones, and swelling of their extremities; the head being large, the spine bent, the abdomen enlarged, and the flesh emaciated and flabby, with all the signs of general debility and impaired assimilation.*

2. This disease was first described by Dr. DAVID WHISTLER, in his inaugural dissertation (*De Morbo Puerili Anglorum dicto "the Rickets."* Lugdun. Batav. 1645.) GLISSON, who soon afterwards wrote on this complaint, states that he was induced to give it the name of Rhachitis, because the spine was so often affected in its course, and because the term nearly resembled *rickets*, the name by which it was commonly known in England before the time at which he wrote. Dr. CUMMIN remarks that the works of WHISTLER, GLISSON, BATE, and others, procured a currency for their opinion that the disease made its first appearance in the western parts of England towards the middle of the seventeenth century, and that it hence was called the *English malady*. The first of these writers published in 1645; the second edition of GLISSON's treatise appeared in 1650; and hence it may be inferred that the complaint had first appeared at a much earlier period. FLOYER, indeed, states that "Rickets first appeared in England about the year 1620." These, as well as other contemporary writers, contend that the disease was considered of recent date; that it first appeared in the southern and western parts of the island, and that it had spread to the eastern and northern counties by the time when GLISSON wrote. Softening of the bones, although most frequently observed in the young of the human species, is not confined to the species; for it has been observed in monkeys, in the several domestic animals, in the ox, the horse, and in pigs; and even in poultry, especially when exposed to cold, humidity, unwholesome air, and to improper diet. Viewing rickets as consisting chiefly of an imperfect assimilation, in which the bones suffer more especially, and evince more or less softening, I shall *first* and chiefly consider it as it appears in *children* — as common or true rickets; and *next*, very briefly as it occurs in *adults*, or as the *mollities ossium* of writers.

3. I. RICKETS AS AFFECTING INFANTS AND CHILDREN. — Rickets has been observed in the fœtus by several writers; but it is doubtful whether or not the imperfect ossification, and consequently softened state of the bones, observed congenitally, should be viewed as rickets, as, in this disease, there is, as will be shown hereafter, a change in the state of the affected bones different from a mere delay or simple imperfection of osseous formation. The complaint has been met with from the earliest months until approaching puberty; but it is most commonly observed to commence during the first dentition, or from six or seven months to three years of age. M. GUERIN states that, of 346 cases, 209 were affected from the age of one to three years. Three cases only were congenital, and 34 only occurred from four to twelve years. Of the 346 cases, 148 were males, and 198 females.

4. i. DESCRIPTION. — The course of the disease has been divided by MM. GUÉRIN and GUERSENT into *three stages*, 1st, that of incubation; 2d, that of deformity; and 3d, that of restoration or of irremediable atrophy, as the termination may be. From considerable experience of the complaint, I believe the division to be useful, and to be based on sound observation. — *A.* The *precursory*, or *incubative* period, does not constitute the complaint; but consists chiefly of that impaired state of the organic nervous or vital functions which occasions those changes constituting the malady; and that state may be associated with a variety of ailments of the digestive and assimilating organs. The transition from apparent health to the incipient state of the disease is always gradual, and consequently more or less slow; but it may be masked by some other disorder, and hence not be recognised until this period has made considerable progress. The impairment of vital power originating the malady is most frequently associated with indigestion, or with chronic irritation of the gastro-intestinal mucous surface, or with bronchitis, or with hooping-cough, or even with lobular pneumonia, and with more or less change of the urine, which, however, has generally been imperfectly examined. Nevertheless, cases

occur in which but little or no ailment, or merely slight debility of the digestive and assimilating functions, has been remarked up to the time of the manifest appearance of the complaint.

5. With the approach of rickets, the child is dull, or sad, or peevish; is averse from play or any action; prefers to sit or lie, appears feeble or indolent, or complains of inability to use exertion, and of pains in the joints and along the bones; the appetite is impaired or is capricious; the bowels are irregular or relaxed, and the stools morbid, or pale, or deficient in healthy bile; the face is pale, and the flesh becomes soft and flabby; perspiration is free on slight exertion, and is weakening and colliquative during sleep, and the skin often moist during the day. The pulse is quick, soft and broad or open, the external veins are large, and the jugular veins much dilated. Thirst is generally present; emaciation becomes evident, and the abdomen tumid. With all these symptoms, however, no evidence of rickets may exist; for they may accompany or usher in other maladies; but, when with these, the urine is more abundant than in health, and when it deposits a copious calcareous sediment, or abounds in the phosphates, then the early or precursory stage of the complaint may be considered as already present; and it is in this stage especially that the salts are most abundant in the urine (§ 16.).

6. The *duration* of this period necessarily varies with the number and severity of the symptoms now enumerated, with the age and constitution of the patient, and more particularly with the quantity of phosphates contained in the urine. It may thus vary from one or two months to six or seven; but, when the head is very large, and the bones of the head imperfectly developed, or the sutures not closed when the abdomen is very tumid, the bowels lax, the stools pale and deficient in bile, and the urine abundant, the second, or developed state of the complaint appears early. The continued operation of the causes, neglect or injudicious treatment, and the occurrence of some local intercurrent affection, may shorten this period; whilst a proper treatment and regimen may remove all the symptoms, and prevent the developement of the disease. In some cases, also, the precursory stage may be hardly apparent; the first indication of the complaint being the actual deformity of the limbs constituting the second stage; the child may have appeared, up to the detection of the flexure of the long bones, in good health; although closer observation and an examination of the urine would have detected more or less evidence of disorder.

7. *B.* The *second period* is that which is characterised by more or less deformity of the bones. The extremities of the long bones, especially those of the ankles and wrists, and the sternal ends of the ribs, are the parts which first evince this stage, by their swollen or knobby appearance; and the lower portions of these bones now begin to yield, especially those of the lower limbs, when the child is so old as to attempt to walk. The increasing softness and yielding of the bones are now apparent in the gradual change of their forms. The lower extremities are usually curved by the weight of the body, whilst their bones yield more or less to the action of the most powerful of the muscles. They generally present the convexity of the curvature outwards, and the concavity inwards. The femurs are sometimes curved forwards, but more frequently outwards, as are the tibiæ. The knees are sometimes bent inwards, and the feet thrown outwards, so that the knees press against each other, and the patient rests on the inside of the foot; and as often the knees are separated to an unnatural distance by the continued curvature outwards of both the thighs and legs, the whole of the lower extremities forming irregular curvatures, with the convexities outwards and greatest at or near the knees. In some cases the angle formed between the neck and shaft of the femur is changed from an obtuse to a right or an acute angle. Much of the deformity which takes place in this stage is owing either to the manner of carrying or placing the child, or to the weight of the body and head upon the lower extremities when attempts are made to stand or walk, and upon the upper extremities also, when the child crawls about on its knees and hands.

8. The head of the rickety child is generally unusually large. The vertex is often flattened; the forehead is prominent and broad; and the centres of the parietal bones expanded. The fontanelle is wide and unclosed; and, if the child be very young, the sutures expand or remain open. The bones of the face are imperfectly developed, or are partially arrested in their growth; and the under-jaw is often elongated. The process of dentition is arrested or delayed; or if they have been formed they soon decay, owing to softening of the fangs, and of the alveolar processes. The clavicles are, after the bones of the lower extremities, the most frequently deformed. The long bones of the upper extremities are much less frequently curved than those of the lower. The spine is generally also curved, owing as much to yielding of the ligaments as to softening of the bodies of the vertebræ. The curvature is commonly outwards, but it is sometimes also lateral-outwards in the back or between the shoulders, where the curvature is also to one side, and to the opposite side in the lumbar region, where also there is sometimes a curvature inwards. The curvatures of the spine, especially outwards, are generally connected with a flattening of the ribs laterally. The ribs are turned inwards, and their sternal extremities, at their connections with their cartilages, are swollen into knobs. Whilst the sides of the chest are thus compressed, the dorsal spine is pushed outwards, and the sternum also outwards, the diameter of the chest, from right to left, being thus much diminished, and the "pigeon breast" formed. (See art. Chest, *deformities of*.) The flat bones, as those of the shoulder and pelvis, are also sometimes affected. The shoulder-blade is, in a few instances, so deformed as to embarrass more or less the movements of the shoulder; but when the bones of the pelvis are softened, the deformity is of the utmost importance, especially to the female, in after life. The change of form in the pelvis is often remarkable, and is extremely various, the sacrum and pubis being carried either backwards or forwards, the ilia directed inwards or otherwise altered, the lower part of the sacrum pushed upwards, and the outlet of the pelvis variously altered in form and diminished in diameter. The progress of deformity is generally from the extremities to the centre of the frame, and more

especially from below upwards, particularly after the first year.

9. The relative proportion of the alteration of the different bones in rickety patients has been stated by M. Guérin. But it should not be overlooked that, as the bones nearest the centre of the frame are the last affected, or are liable to deformity only at an advanced stage, and in neglected or ill-treated cases, the statistics he has furnished are open to the objections which may be urged against the statistics of other diseases — whether the relative proportion, or numerical calculations, be applied to symptoms, or to organic changes, or to remedial results,—objections based on the differences of disease owing to varying combinations of predisposing and exciting causes; to endemic and epidemic influences; to seasons and weather, to modes and manners of life, and to numerous circumstances, to which it is needless here to advert. M. Guérin states that, of 496 cases of rickets, eleven only had swellings of the extremities of the bones without curvature; and of the 485 with curvatures, 59 had at the same time deformity of the thorax, 48 deformity of the spine, 17 enlargement at the same time of the cranium, and 14 only deformity of the upper extremities simultaneously with these alterations.

10. During this stage, the deformity of the bones is not the only change. The alterations mentioned in connection with the first stage continue during this. The abdomen continues tumid, or increases in size, and is more tympanitic, the limbs more emaciated and flabby; the child more languid and weak; the perspiration free and readily increased; the thirst increased; the pulse quick, small, and weak, with slight hectic symptoms; and pains are complained of in the bones and joints. The bowels are irregular, or loose, and the stools pale or almost devoid of healthy bile. The general emaciation and change in the bones allow the head to appear larger than usual, whilst it is often only large in proportion to the rest of the body; and whilst all other parts of the frame, the bones especially, cease to grow, during this stage, the head appears even to enlarge, and the faculties of the brain to be developed, sometimes precociously.* The cessation of growth, particularly of the bones, during this period is most remarkable in the lower extremities, and less so from below upwards. M. Guérin states, that his comparisons of the skeletons of rickety subjects, with those of the same age and sex who had not been rickety, gave the following per centage of reduction in the different bones: — in the fibula, 28 per cent.; in the tibia, 25; in the femur, 22; in the cubitus, 19; in the humerus, 15; in the clavicle, 9; in the sternum, 8; in the spine, 5; and in the pelvis, 17 per cent.

11. The *duration* of this stage necessarily varies with the persistence or removal of the causes during treatment, with an early or delayed recourse to judicious means, with the diet and regimen, and with the local affections which may complicate the disease. In the more rapid states of the complaint this stage may not continue longer than two or three months, whilst in more chronic forms, and when the complaint has been long neglected, and unfavourable circumstances continue their influences, this period may extend even to several years, the deformity and its attendant symptoms either very slowly increasing or remaining nearly stationary.

12. *C.* The *third stage*, or *period of restoration*, or that attended by either a favourable or unfavourable change, is marked by no very sudden alteration from the state above described; it appears gradually, but rarely rapidly, unless some intercurrent disease, or local affection supervene; and this is not infrequent. —(*a.*) If the disease does *not tend towards recovery*, the emaciation increases, the abdomen is more distended, and the bowels more disordered, whilst the secretions and excretions are still more morbid than before. The deformity of the bones continue or increase; and ultimately the child is carried off by disease of the lungs or of the abdominal viscera, or several lesions of the thoracic and abdominal organs may co-exist in the same case and terminate life, as congestion of the lungs with effusion into the pleura; general bronchitis with gastro-intestinal irritation; lesions in the digestive canal with enlargement of the mesenteric glands; crude tubercular formations in the lungs, with tubercles in the membranes of the brain, and effusion in the ventricles or between the membranes, &c. If the child is not carried off by one or more of these, and continues deformed, without any amendment of the symptoms, the softness of the bones is much diminished, their flexibility is lost, they are more atrophied, and they are more readily broken; the deformity often still increasing. Recovery then rarely takes place; a complication of internal disorders, consequent upon structural changes, and upon a morbid state of the blood, ultimately terminating life.

13. (*b.*) A *favourable change* from the second stage is evinced at first by the states of the secretions and excretions. The urine assumes a more natural appearance and composition (§ 16.); the stools are more healthy, and coloured more deeply by bile; the abdomen appears less tumid and less tympanitic; the pulse is less frequent, and pains in the limbs are not so much complained of. The countenance presents more animation; and the hectic or remittent febrile symptoms and thirst subside gradually. The appetite is less capricious and more natural; and, with the continuance of these changes, the flesh becomes firmer, and voluntary motion is made with greater activity. The growth of the limbs, which had been suspended until now, proceeds with remarkable vigour; the bones are gradually restored, and, if the deformity is not very great, it disappears by degrees; the curvatures are either diminished or altogether removed; the swellings of the epiphyses of the bones subside, and ossification proceeds with great rapidity, the affected bones ac-

* Mental precocity is not, however, always seen; for sometimes the child continues dull, taciturn, or stupid, or even idiotic. These opposite states have been explained by supposing that the openness of the sutures has allowed the circulation and developement of the brain to advance at an increased rate, and the faculties of the mind to expand; whilst the closure of the sutures, and the consequent unyielding state of the cranial bones, have confined and embarrassed the functions of the brain, and occasioned the opposite state of the mental powers. But, as far as I have observed, precocity has not always existed in connection with openness of the sutures; nor stupidity with their closure. Perhaps the chemical pathologists, who attempt to explain all by chemical changes, will account for the different phenomena by ascribing them to the state of the blood and to the excess of phosphates in it, during their passage from the bones to the kidneys, by which they are eliminated.

quiring greater density and strength than usual. The muscles also acquire a more powerful developement, so that persons who have been rickety in childhood have afterwards become remarkable for strength.

14. (*c.*) During *recovery* an excessive ossific action often occurs, more especially in the parts which had been swollen and softened during the stage of deformity. Not only are the sound bones more dense, but, in some intances, a state of hyperostosis or extoses more or less numerous, especially near the epiphyses and sutures, is observed. I have seen this occur most remarkably at the terminations of the ribs and commencement of the cartilages, the whole being more or less soldered together, and also with the sternum. Occasionally slight accessions of fever are observed during recovery, and either advance the process of restoration, or are the mere concomitants of the change taking place in the bones and system generally. If the complaint occur in children about the second year of age, or later, although t may be of considerable duration, amendment is generally rapid when it commences; and even when the growth is stunted, and the deformity is still considerable, still the period of puberty may remarkably develope growth and diminish the deformity, especially when the advantages of a favourable change of air and out-doors exercise are enjoyed.

15. When the disease is attended by an outwards or lateral curvature of the *spine*, or with flattening of the ribs and protuberance of the sternum (see art. Chest, *deformities of*), recovery is imperfect and protracted, and the more so the greater the deformity arising from the curvatures of the spine and the flattening or bending inwards of the ribs. In these cases the functions of the lungs are impaired, and the more advanced parts of the assimilative processes are mpeded. In many of these cases, especially in those which are the most deformed, and when the spinal curvature is so extreme as to form a dorsal hump, the deformity continues through life, the duration of which it may considerably abridge, by avouring the supervention of congestion of the lungs, or bronchitis or pneumonia, or even asphyxia, by pressure on the origins of the spinal nerves. In some, the curvature diminishes with the restoration of health, aided by suitable treatment and regimen; but, in others, it increases, sometimes after having been long stationary, owing to some change in the general health, or to debility, or to disease, when ultimately a fatal termination takes place in the way now stated.

16. *D. The urine in rhachitis* presents more or less change from the healthy state. Generally it is much more abundant than might be expected, considering the free transpiration from the skin. It is commonly pale, but it is sometimes of natural colour. The urea, and uric acid are diminished, whilst the salts are increased. A free acid is sometimes observed, which has been said to be the phosphoric, but this requires further investigation. The phosphates are more abundant than in health, and more especially than in healthy children; and a considerable sediment of oxalate of lime is not infrequent; and it has been observed that urinary calculi are frequent in rhachitic children. As far as my own observation enables me to state, the increase in the fixed salts is most considerable during the advance of the first stage, and when the deformity begins to appear in the bones: it is less remarkable when the disease is far advanced, and the softening and flexures the greatest. The phosphate of soda and the earthy phosphates are most abundant. In a case examined by Marchand (*Lehrb. der Phys. Chemie.* p. 338.), the urine contained much lactic acid and lactates, and a great excess of the earthy phosphates. In a case by Mr. Solly (*Transact. of Roy. Med. and Chirurg. Soc. &c.*, vol. xx. p. 448.), three or four times the usual amount of phosphate of lime existed in the urine. The exact composition of the urine during the third stage, especially during a return to the healthy state, has not been shown.

17. *E. Various complications* often occur in the course of this complaint. These may be either of an acute or chronic nature. Rickety children may be the subjects of the usual disease of childhood, as hooping-cough, measles, scarlet fever, small-pox, &c., or of bronchitis, pneumonia, inflammatory irritation of the digestive canal, enlargement of the spleen, scrofulous enlargement of the glands, tubercular productions in the lungs and other organs, cutaneous eruptions, &c. Most of these are accidents by no means necessarily consequent upon the rickety constitution; but, when the disease is far advanced, or is attended by deformity of the spine or chest, then the affections of the lungs, pulmonary congestion, effusions into the shut cavities, and disorders of the digestive organs, may be favoured by such deformity. The complications now mentioned, which are not specific, and which result not from infection, are often produced by certain of the causes which combine to produce this malady, or by influences to which children in this state are often exposed, more especially to various endemic influences, as a close, cold, and humid air, and injudicious diet. M. Guersent remarks, that he has seldom found rickety children the subjects of tubercles, although he has observed two-thirds of children who have died of other diseases present tubercular formations in some of their organs. M. Rufz also states, that in twenty rickety subjects he found tubercles only in six. There can be no doubt of these complications having the effect of aggravating and accelerating the unfavourable progress of the disease in most cases; the only exceptions being when the eruptive fevers occur in a mild form, and then, in a few cases, they have appeared to impart a new and favourable state of vascular action to the frame. In the most severe and advanced cases, other complications than those already mentioned often occur, and, in the weakened state of constitution, frequently terminate life. These are chiefly colliquative diarrhœa; hectic with colliquative sweats; congestion of the brain, with or without effusion, and attended either by coma or convulsions, fractures of the long bones on sudden motion, retension of urine, complete or incomplete palsy chiefly in the form of paraplegia, and loss of one or more of the functions of sense.

18. *F. The appearances after death* possess interest, not merely as respects the state of the internal organs and the lesions in them to which death is more directly owing, but as regards the changes observed in the bones themselves. These latter changes can be observed in the early periods of the disease, only when the patient is carried off

by some complication or intercurrent disease. M. Guérin has observed the alterations which take place in the *bones* during the three periods of the disease, and from his researches I am enabled to give the following account: — (*a.*) When death is caused by some acute disease affecting a rickety subject during the *first stage*, as sometimes happens, the long bones, when quite fresh and not previously exposed to the air, are congested with a large quantity of dark blood, which exudes from all parts when the bone is divided either longitudinally or transversely. This blood appears not to be contained in blood-vessels, but to be effused on each side, in the medullary canal between the medullary membrane and bone, in all the areolæ of the spongy structure of the diaphyses, of the epiphyses, and in the intermediate tissue which unites these two portions of bone, and under the periosteum, which is evidently injected and thickened. Blood is also interposed between the lamellæ of the compact structure of the bones, these admitting of an easy separation, and allowing this fluid to exude in numerous minute points. The blood is at first very fluid, and is readily removed from the surfaces on which it exudes; but, at a more advanced stage, it loses its dark colour, becomes gelatinous and semi-transparent, and adheres firmly to the surface of the osseous tissue. It then presents the rudiments of minute capillary vessels. During these changes in the blood the vessels of the bones acquire an increased developement; the openings through which the vessels pass to and from the interiors of the bones are much dilated, and the osseous system is the seat of a remarkable sanguineous congestion, in which the small and flat bones also participate more or less.

19. (*b.*) In the *second stage*, the osseous tissue is manifestly more or less softened, admitting of flexures according as the weight, pressure, position, or muscular actions of the body may direct them. On examining closely the structure of the long bones, the swellings of the diaphyses and epiphyses are found to be owing to the developement of a very fine spongy tissue, of a new formation, which M. Guérin has named the "*spongoid tissue*," to distinguish it from the ordinary spongy structure. This tissue consists of very fine irregular areolæ, which replaces the sanguinolent fluid charging the bones in the first stage, and is found spread out underneath the periosteum, forming a coat from one to two lines in thickness. It is found also between the lamellæ of the bones, where it may be detected by its darker colour; and between the bone and the medullary membrane; but it is abundant around the epiphyses. It is also abundant, and more dense at the concavities of the flexures than at the convexities; and it is found in both the long and flat bones. The periosteum s more or less vascular and thickened.

20. (*c.*) The *third stage* presents changes in the bones very different from each other, according to the termination it assumes. When recovery and consequent re-ossification take place, the *spongoid tissue* of the new formation is nearly altogether transformed into a compact structure, especially in the concavity of the curvatures; and it is so abundant towards that part where the medullary canal is most contracted, as to invade the greater part of the canal by osseous lamellæ. Whilst the compact structure acquires a very great density, it becomes the whiter the longer the duration of the consolidation, until it assumes the hardness and appearance of ivory. Disseminated through this structure in the diaphyses, and in the epiphyses as well, irregular open spaces are sometimes observed, apparently resulting from a partial resorption or from a retraction of the solid parts. When re-ossification does not take place, the compact structure is thin, fragile, dry, or compressible, especially around the epiphyses. The areolar tissue found within this thin osseous shell consists of large unequal or irregular cells, which extend throughout the whole of the medullary canal, which is filled with very fine osseous lamellæ surrounded by an oleaginous fluid. This alteration, which is found also in the epiphyses, M. Guérin has named "*Rickety consumption of the bones.*"

21. (*d.*) It must be evident from these alterations that the bones will present important chemical results upon analysis; and that the chemical changes will vary with the amount of softening, and of the alterations just described; and as these latter vary in different cases, in the same case at different periods, and in different bones in the same subject. According to Bostock and Bequerel, the earthy constituents of the bones are remarkably diminished during the early stages of the complaint. In two children who died of pneumonia during the early period of rickets, the bones of the cranium presented but a slight diminution of the earthy phosphates, whilst the femur, the tibia, and the sternum, contained only from a fourth to a twelfth part of the proportion usually observed in health.

22. (*e.*) The complications of the disease above enumerated, will suggest many of the visceral lesions observed in fatal cases of rickets; for to these death is generally more immediately owing. The brain is found more or less large relatively to the rest of the body; and fluid is often effused within the ventricles and between the membranes, which in a few cases have presented small or crude tubercular formations. Effusion of serous fluid is sometimes found in the pleural cavities; and the lungs often are pushed downwards by the lateral pressure of the ribs. The bronchi are often inflamed or congested, the lungs are congested, or in parts resemble the structure of the spleen, or contain, in some instances, tubercles in various stages of developement. The heart is often paler than natural, and, in a few instances, has presented incipient organic lesions, especially when the complaint has been of long duration, and the deformity of the chest has been considerable. The liver and spleen are often pressed downwards by the thoracic deformity; and both organs are sometimes found more or less enlarged—the liver frequently paler than natural. The alimentary canal is generally very much distended by flatus, and the mesenteric glands are more or less enlarged, and occasionally contain crude tubercles. The different series of glands contained in the digestive villous surface are either enlarged or ulcerated, particularly when the disease has been complicated with intestinal disorder. The muscles are generally very flabby, pale, and wasted; the adipose tissue is wasted by absorption; and what remains appears soft and almost fluid. The whole of the structures, visceral and external, present a state of flabbiness or softness.

23. ii. Diagnosis and Prognosis. — *A.* The

Diagnosis of this complaint is sufficiently easy, excepting in the precursory stage; and then it is often as difficult as it is important to detect the approaching mischief. In this stage the complaint may be mistaken for several incipient diseases, especially for tubercles in the lungs, for tubercular peritonitis, for tubercular disease of the brain or of the cerebral membranes, or of the spine. A short time and an attentive observation of the symptoms, will soon show whether or not they agree with those described as characterising the first stage (§§ 4, *et seq.*); and when enlargement of the ends of the long bones, and especially when these become at all deformed, the diagnosis will be manifest. If any mistake should be made, or any difficulty of diagnosis between the incipient states of these maladies should arise, but little evil need result, as the treatment would not be inappropriate to either of them. It is evident from the changes observed in the bones, especially those evincing reossification, that the softening of the bones of children, or *true rickets*, is, in very essential points, a distinct disease from the *softening of the bones* sometimes observed in adults, especially in females, although I have considered it at this place as a species of rickets, from the softening and deformity attending it. This latter, the true osteomalacia, or mollities ossium, is never followed by reossification, especially when it is consequent upon chronic or malignant diseases, or the puerperal state. Curvatures of the spine supervening in the course of rickets, should not be confounded with those curvatures caused by tubercular or scrofulous disease of the vertebræ on the one hand, or by relaxation of the ligaments, &c. on the other. (See Art. SPINE). Nor should it be overlooked, that the curvatures of the spine, so frequently observed connected with deformity of the chest, may exist in children as well as in adults, or young persons about the age of puberty, without the least degree of rickety change in the bones; that this curvature, as well as the deformity of the chest and sternum (described in article CHEST, *deformities of*), may exist, on the one hand, either separately or together, both in children and in adults, no other deformity of the bones being present; that either or both deformities may, on the other hand, supervene in the progress of true rickets, and of mollities ossium, or the rickets of adults; and that, when curvatures of the spine are thus associated with true rickets, or with mollities ossium, the bones of the pelvis are generally also deformed or contracted in various directions, more especially when the lower extremities continue much bent and shortened by true rickets, and when the softening occurs in adult age. It is worth noticing, also, that the extremities, especially the lower, not only cease to grow during the disease, but also continue much shorter during life, although they have acquired remarkable strength.

24. *B.* The *prognosis* depends not only upon the progress and severity of the complaint, but also upon the combination, or persistence of the causes, and upon the effects produced by treatment. If the child be not remarkably debilitated, if the disease be not far advanced, and if the deformity have not invaded the spine, or pelvis, or parietes of the chest, a favourable result may be expected from treatment; but when vital power is much reduced, when the deformity is great, and has extended to the spine, or to the chest, or to the pelvic bones; still more especially when it is complicated with serious visceral disease or lesion, and when the deformity is such as to impede the respiratory functions, or when the head is affected, and sopor, coma, or convulsions supervene, or when the urinary functions are disordered; then complete recovery should not be expected; and, although life may in many cases be indefinitely prolonged, yet it may be very rapidly terminated, particularly in the latter circumstances. An unfavourable issue is the more likely to occur the earlier in infancy the complaint appears, the more serious the disorders which usher it in, and the more manifest and marked the predisposing causes existing in the parents.

25. iii. CAUSES.—A due recognition of the remote causes of rickets is of the utmost importance in preventing and in curing the disease.—*A.* The *predisposing causes* are not merely those which act externally on the child, but those also, and often especially, which are derived from the parents and the nurse—these latter sources, which have been too much overlooked at the present day, but to which BOERHAAVE and his commentator have directed attention.—"Maxime autem infestus habetur proli, cujus parentes laxa et debili conditione corporis, otiosi, molles, opipara mensa, cibis pinguibus, saccharatis, pauca pane, vinis dulcissimis, et aqua multa calida, usi, morbis chronicis, venere, ætate, exhausti, tabi inprimis venereæ, et iteratis gonorrhœis, multum obnoxii, effœtam ferme genituram impenderunt generandis liberis." (§ 1482).—There is much truth in this enumeration of the predisposing causes derived from the parents. In respect of the influence to be ascribed to the exhaustion produced in the parents by chronic diseases, venereal excesses, and age, VAN SWIETEN remarks:—"Tales parentes, debiles, morbosos, languidos, infantes gignere, nemo dubitat. Unde inter signa sanitatis optimæ numeratur, si quis natus sit parentibus sanis, vegetis, plenæ ætatis, rara sed fervida venere utentibus. *Lycurgus* qui validis exercitiis firmabat virginum corpora, antequam viris jungerentur, voluit, ut recens nupti non cohabitarent, sed clam et furtiva quasi venere uterentur tantum, adeoque rara et fervida. Talem curam gessit robustæ et bellicosæ posteritatis. Facile patet, qualis proles expectanda sit a decrepitis, uti et ab illis, qui, in ipso ætatis vigore, libidine ac perditissimo vivendi genere exhausti, conjugia ambiunt, dum, ante trigesimum annum jam imbelles senes, lectissimas virgines turpiter decipiunt." (Vol. v. p. 587.).

26. There can be no doubt that these causes, so strongly insisted upon by BOERHAAVE and VAN SWIETEN, predispose to this disease in the offspring, by imparting an innate or congenital debility to the infant constitution, although they cannot be viewed as imparting a more especial tendency to it than to scrofula, or to other diseases of debility to which this is more or less closely allied. The children of parents who have married at a premature age, or who have indulged in sexual excesses, or who have been guilty of self-pollution, or who have become debilitated by other causes of exhaustion, as by living in unhealthy localities, or in the foul air of crowded factories, or by sleeping in close or crowded sleeping chambers, are predisposed to this, amongst other maladies, which are allied more or less to each other,

as respects their causes, rather than as regards their forms or seats. Certain of the predisposing causes existing in the parents, to which BOERHAAVE imputed a considerable influence, and which probably did, at the time he wrote, and still more so when rickets first became a frequent disease, possess this influence, namely, the taint or constitutional debility consequent upon venereal or gonorrhœal affections, may not, in the present day, produce this effect upon the offspring in so remarkable a manner as in those times; still I am convinced that they are not without some effect, although I believe that they are more influential in developing a scrofulous diathesis than in predisposing to rickets.

27. The effect of *leucorrhœa* upon the offspring, more particularly as predisposing to rickets, may admit also of doubt; still some of the best medical authorities have insisted upon the influence of this complaint in the parent. STORRCK contends that females who are subject to leucorrhœa, are liable to suffer abortion, or to have rickety children. —"Monebat, tales mulieres, nisi integre curentur antequam nubant, facile abortiri, si conceperint. Dum felici arte cavebatur abortus ita, ut fœtus ad maturitatem perveniret, notavit sequentia. *Tales autem fœminæ pariunt plerumque infantes crassos, pingues, robustos, et hi tales manent per plures menses: postea vero emaciuntur, lassi fiunt et membra pendula gerunt; tandem subsequitur pessima rachitis, quæ raro huc usque sanari potuit.*"

28. The *predispositions* referable to the children themselves have not been sufficiently investigated. Rickets have been observed in all constitutions: in the dark, the fair, the delicate, and the apparently robust; but most frequently in the delicate, in the sickly, in the soft and flabby, and in infants with large heads, whose fontanelles remain open, and whose dentition is delayed. Insufficient nourishment, unhealthy milk, early weaning, or "bringing up by hand," a watery farinaceous diet after weaning, a too exclusive use of vegetables, and the want of animal diet in cold and damp localities, and the periods of the first and second dentition, favour the occurrence of the complaint, especially in the constitutionally or hereditarily predisposed. Indeed whatever debilitates the frame not only predisposes to rickets, but also sometimes more directly developes it.

29. *B.* No particular *exciting cause* can be adduced in some cases to account for the appearance of the disease, besides those which I have enumerated as being occasionally predisposing influences. But when these act in combination, and when other fortuitous circumstances aid their operation, they produce a more direct and exciting effect. Probably, however, residence in a cold and damp locality has a still more direct influence in developing rickets, even than those causes already mentioned, although without their aid this cause may not produce this effect. Indeed the disease is even *endemic* in those places which are cold and damp, and where the poor are insufficiently fed and clothed. I believe that the abuse of spirituous liquors by either parent is not only a predisposing, but also an exciting cause of the complaint, and that it is more especially such when the vice is indulged in by the mother during the period of lactation. The murderous practice of giving narcotics to infants, so notoriously prevalent amongst many of the physically and morally degraded of the manufacturing population, may produce a similar effect where it fails of causing a more rapid extinction of life.

30. *C.* The *proximate cause* of the change in the bones, of which rickets is the result, is still unascertained. No satisfactory explanation of the changes which take place in this part of the frame has hitherto been adduced. It has been suggested, that a superabundance of acid in the blood may cause the removal of the phosphates from the bones; but there has been no analysis of the blood in this disease, and the existence of an acid, and still less the kind of acid, in the blood have not been shown.* If the change were owing to the state of the blood entirely, it might be expected that the bones would undergo the same amount of softening and of chemical alteration throughout the frame. But this is found not to be the case, for the bones of the lower extremities experience these alterations in a much more marked degree and much earlier than those of the head or trunk. It may therefore be inferred, that whatever agency the blood may exert must be directed or influenced by the vital or the organic nervous influence, to which the nutrition of the several structures is chiefly to be imputed. We only know that the disease results from many depressing causes, acting in various combinations, but always producing a constitutional debility, depressed organic nervous energy, imperfect assimilation and nutrition, and consequently a morbid state of the blood, with all the consecutive changes observed first in the softer structures, and ultimately in the bones; but our knowledge has advanced no further than this, either in amount or in precision.

31. iv. TREATMENT.—*A.* The *prophylactic treatment* of rickets consists chiefly of the avoidance of the causes which occasion it, and of the adoption of those hygienic means which are requisite at all periods of early life, and more especially during the epochs of infancy and childhood. A healthy nurse, a warm and dry atmosphere, change of air, due ventilation, the animal warmth communicated by a healthy mother or nurse, suitable food—suitable as respects the periods of lactation, of weaning, and of dentition; attention to cleanliness, to dryness of the clothes, and to the warmth of the lower extremities, are the most efficacious measures, as far as concerns the child itself, that can be adopted for the prevention of this malady.

32. *B.* The treatment of the *successive stages* of the complaint depends much upon the visceral and constitutional disorders attending them. These disorders, especially when neglected or improperly treated in the first stage, tend to develope the rickets; and, in the second, either to retard recovery or to endanger the patient.—(*a.*) When any of the affections, which have been mentioned

* Although the existence of lactic acid in the blood has not been demonstrated, it may probably exist; for it is not unlikely that this acid is formed in excessive quantity in the digestive canal during the early stages of the disease, owing to the nature of the ingesta and the state of the primary assimilation, and that, being carried into the circulation, it there affects the functions of nutrition, and impairs organic nervous energy, although its accumulation in the blood, in a large or very sensible quantity, will be prevented by the depurative actions of the skin and kidneys. It may also be remarked, that the formation of lactic acid in the digestive canal, and its excessive excretion by the emunctories, are phenomena of familiar occurrence in rheumatism, in the puerperal state, and in several diseases, during which softening or other changes in the bones have sometimes taken place.]

as complicating the *first stage*, appear in conjunction with those symptoms or indications of incipient rickets — more particularly with an excess of the phosphates in the urine, the treatment of them should be conducted with much caution; for they have been too frequently viewed and treated as inflammatory, when they have been only the results of irritation, or consequences of the presence of irritating materials circulating in the blood, and of an asthenic state of organic nervous power. When, therefore, any of the disorders noticed above (§ 17.) are observed to complicate this stage of the complaint, they should then be removed by means directed more especially to the improvement of the secretions and excretions, to the mitigation of both local and constitutional irritation, and to the promotion of vital power. In order that these intentions should be fulfilled with due success, the states of the perspiration, of the urine, and of the intestinal discharges should be carefully and almost daily examined. The urine particularly ought to be tested and chemically investigated; and, upon the states of these excretions, the choice of medicinal agents, as well as of diet and regimen, should mainly depend. The primary processes of assimilation especially require attention; and these are generally most efficiently promoted by a suitable diet, and by a warm and dry atmosphere.

33. When the *urine*, although abounding in phosphates, nevertheless presents an acid re-action, and when it does not become rapidly offensive, then alkalies may be given with tonics, sedatives, or alteratives. The irritative fever and quickness of the pulse, frequently attending the first stage of the disease, have often induced the physician to prescribe lowering means, when a restorative treatment was actually required. But the attendant fever being characterised by nervous asthenia, by copious or colliquative perspirations, by pale phosphatic urine, by general palor, and by the softness of the pulse, these furnish sufficient indications for restorative remedies. The alkalies most serviceable in these circumstances are, the carbonate of potash, the liquor potassæ, or BRANDISH's alkaline solution, or magnesia, with infusion or decoction of cinchona, or infusion of cascarilla, with aromatics. If the carbonates be prescribed, small doses of the dilute hydrocyanic acid, or of the extract or tincture of conium, will be of use. If the urine present only a slightly acid re-action, or if it be already, or soon become alkaline, the mineral acids, especially the hydrochloric and the nitric, or the combination of both, may be given with aromatics, or with small doses of the hydrocyanic acid, or of opium, or of conium.

34. If the *bowels* be confined, they should be sufficiently opened, and all fæcal accumulations and morbid secretions evacuated by means of stomachic aperients, especially the compound decoction of aloes, or equal parts of the compound infusions of gentian and senna, or rhubarb with aromatics. When the stools are devoid of bile, it will be preferable to attempt to procure an increased secretion by means of the nitro-muriatic acids, given internally, or used externally at a warm or tepid temperature, than to administer mercurials, which tend to depress still further the already impaired organic nervous power. Occasionally, however, the hydrargyrum cum creta will be given with benefit in conjunction with rhubarb, and cinnamon or ginger. If the patient be so old as to swallow a pill, these will be most advantageously combined with the inspissated or purified ox-gall. If the bowels be relaxed, or the stools yeasty, and the patient much griped, or pained generally, the alkaline medicines (§ 33.) may be given in lime-water and milk, with minute doses of tinctura opii, or of tinctura camphoræ composita, or of tinctura lupuli; and an enema, containing the same ingredients, may be occasionally administered. In these latter circumstances, liniments or embrocations containing either of the balsams or turpentines, or camphor, applied over the abdomen, are of essential service. The terebinthinates and balsams are severally of use, when given internally, but they ought to be prescribed only occasionally, and in small doses, so as not to irritate the urinary organs. Emetics have been advised, but they are of service only when this stage is complicated with hooping-cough or bronchitis, and even then chiefly with the view of procuring a discharge of accumulated secretion from the bronchi, when there is difficulty in expectorating it. During this period, as well as in the second, when there are marked palor of the surface, and frequent sweats, the mistura ferri composita, made agreeable with liquorice powder, is eminently beneficial; and if any pulmonary symptom exist, conium should be added. If the bowels are torpid, this mixture may be conjoined with the decoctum aloes compositum.

35. In this stage, as well as in the next, sponging the back, loins, and thighs, with a tepid solution of bay-salt, or with tepid sea-water, is generally of service, especially when followed, or preceded by active friction of the surface. The complaint in this stage is often quickly arrested by change of air, especially to a warm and dry situation, and more particularly to such a situation near the sea-coast. In the cases of infants at the breast, due attention should be paid to the states of health and of the milk of the nurses; and the treatment of the infant should be partly conducted by directing such means to the mother or nurse as will correct or improve this secretion. If this object cannot, or is not likely to be attained, a healthy nurse should be procured. If the complaint appear about or after the period of weaning, a sufficient quantity of ass's milk should be given daily; or the farinaceous articles of diet may be allowed with mutton, veal, or beef broth or tea; or warm gellies, or the yolk of an egg, may be taken once or twice daily.

36. *C.* In the *second or deformed stage*, the treatment should be in many respects the same as now described. The febrile irritation sometimes observed is still more remarkably the result of debility conjoined with a morbid state of the blood than in the first stage; and hence it ought not to interfere with the adoption of tonic and restorative medicines, which, when duly selected, will be the most efficient means of improving the various secretions and excretions. As in the former stage, so in this, a particular attention should be directed to the urine; and according to the states of this excretion, as well as of that from the skin, the decoction or infusion of cinchona may be given with the nitric or muriatic acid, or with both; or with the solution of potash, or with BRANDISH's alkaline solution, or with a preparation of am-

monia, and some warm aromatic. The sulphate of quina with sulphuric acid may be substituted for the above, especially when the skin is flabby and covered with perspiration, and if there be obvious anæmia, or even in other circumstances, the compound steel mixture may be given as above (§ 34.), or the muriated tincture of iron in the infusion of calumba or quassia, or the iodide of iron in the syrup of sarza. This is the best preparation of iodine for this disease; although the iodide of potassium, taken in a tonic decoction or infusion, is often of service. In this stage, and not less so in the first, the cod-liver oil will be found very remarkably beneficial. I have prescribed it for every case of this complaint which I have seen since 1844. This oil is now prepared by the principal chemists in the metropolis from the fresh livers; and, thus prepared, it is a much less unpleasant medicine than in the state in which it was formerly procured. But of the several fish-oils which may be prescribed — those of the cod, of the ling, of the skate, &c.—the oil from the liver of the torsk is certainly to be preferred, according to my observation; and it may be readily procured from the Shetland Isles, the only place in this kingdom where this fish is abundant.

37. In this stage more particularly several earthy preparations have been recommended with the view of furnishing the materials for the reossification of the bones. But, as the disease is not so much the result of any deficiency of the elements of bone in the nutriment, as in the failure of organic nervous or vital energy, whereby these elements form and unite in the tissues during the processes of assimilation and nutrition, so it may be inferred, that much less importance may be attributed to the administration of substances containing the constituents of bone, than has been attached to it by some writers. Nevertheless, as several of these substances are useful in controlling certain of the symptoms, or in exciting the actions of assimilating organs, or in rousing organic nervous power, they may be given with advantage, especially lime-water charged with fixed air, magnesia similarly charged, or effervescing, or either of these conjoined with other means; the muriates or chlorides of lime, or of baryta in minute doses, and the phosphoric acid and certain of the phosphates; but it is doubtful whether these latter are beneficial or injurious in any stage of rickets. I have prescribed the chlorate of potash with other tonics in several instances with benefit; and when the liver is torpid, small doses of mercury with chalk and rhubarb; or, when the stools are frequent, acid, and yeasty, with the compound cretaceous powder, or with this powder and minute doses of opium. In these latter circumstances, the treatment above recommended when colliquative diarrhœa is present (§ 34.) may be adopted, or powders may be given containing small doses of powdered cascarilla bark, cinnamon, and the carbonate or sulphate of iron. Most of the preparations of iron are beneficial in this stage, more especially those already mentioned, and the citrate of iron, the tartrate of iron and ammonia, and the vinum ferri, either of which are readily taken by children.

38. In this stage, the same *external means, diet*, and *regimen* as was prescribed for the first should be observed, varying each, according to the effect and the peculiarities of the case. BOERHAAVE, VAN SWIETEN, and others, have advised, and I am confident that the advice is judicious, that the utmost care should be taken to preserve the beds and bed-clothes clean, fresh, and perfectly dry; and to dust the surface of the body with tonic, astringent, and aromatic powders, especially when the perspirations are colliquative or weakening, and after warm salt-water bathing or sponging, or after the tepid salt-water douche on the back, loins, or limbs. In this state of the complaint, tepid chalybeate baths, variously medicated baths, and the thermal springs, recommended for chronic RHEUMATISM (§ 142.), may be employed, as well as the Tunbridge waters, and the natural or factitious mineral waters recommended for that disease (§ 151.). The child should be kept as much in the open air as the temperature and weather will permit, and in the sun-shine. The utmost care ought to be taken that the position, either when lying, or when being lifted or held up, should be such as not to bend the bones from their natural direction. As the weight of the trunk and head is apt to bend the long bones when the patient is allowed to stand or walk, either too early or in this stage; and, as the weight of the head is liable to produce curvatures of the spine, when the patient is allowed to sit too long, or too much, a recumbent or reclining position should be adopted at intervals, or for a considerable period during the day. A properly constructed couch or bed, on which the patient may lie either on the back or on the abdomen, and use his arms and hands without difficulty, will prove of great benefit; and a recourse to frictions of the surface, especially over the back and abdomen, will at the same time be of service. Galvanic or magnetic electricity will be productive of much advantage in this disease, especially if aided by judicious treatment, regimen and diet. When the legs are chiefly or only affected, standing or walking should not be allowed. In these cases, particularly when the curvatures are outwards, I have often directed the legs to be tied together, or confined by a broad band, bandage, or handkerchief, so as to prevent walking, and to resist the curvatures, or press the flexures in a proper direction. For this, and other kinds of curvature, various mechanical modes of treatment have been employed; and iron, or steel, or metal supports, or implements of different kinds and shapes, have been adopted. But these means, although sometimes of service in diminishing superincumbent pressure, or in resisting the disposition to flexure, are often injurious by preventing the muscular actions, and by embarrassing the circulation of the parts or limbs. Moreover, all metal supports are injurious, however carefully they may be covered, by conducting the animal heat, and the electricity always circulating through the frame and favouring the passage of both into the surrounding air. When the complaint is either so severe or so extensive as to implicate the vertebral column, or the parietes of the chest, or both the one and the other, the remarks I have offered on deformities of the CHEST, as well as of those of the SPINE, are altogether applicable to those more extensive forms of rickets. (See CHEST and SPINE).

39. II. RICKETS IN ADULTS. — SYNON. — *Mollities ossium; Osteomalacia; Malacosteon, softening of the bones in adults*, &c. — This com-

plaint, although resembling in many respects the rickets of children, is in others a different disease; more especially as respects the changes which take place in the texture and fibrous membranes of the bones. It is more frequently observed in females than in males, and it oftener affects the pelvis and spine than other bones; but it may extend to nearly all the bones, such cases, however, being very rare. I can add nothing at this place to what I have adduced respecting the *causes*, *nature*, and *treatment* of *mollities ossium*, or the *softening of bones in adults*, in the article OSSEOUS SYSTEM (§ 27. *et seq.*).

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ROSE-RASH. — SYNON. — *Roseola* (from *ros*, a rose; or from the Italian *Rosso*, red), Willan, Bateman, &c.; *Rosselia*, *Rossenia*, Auctor. — *Exanthisma roseola*, Young; — *Exanthesis roseola*, Good; — *Rubeola spuria*, Frank; — *Rosellina*, Auct.; — *Roseola*, *Eruption rosacée*, *Fausse rougeole*, Fr.; — *Rothlau*, *Rother hund*, Germ.; — *Red-rash*, *False Measles*.

CLASSIF. — 3d. *Order*, Exanthemata; 4th. *Genus*, Roseola; Rose-coloured efflorescence (Willan). III. CLASS. III. ORDER. (*Author*).

1. DEFINIT. — *An eruption of small rose-coloured patches, of irregular forms, very slightly elevated, not papular, transient, and passing into a deeper roseate hue as they slowly disappear; the patches being either limited to a part, or to the limbs, or dispersed over the body, preceded and attended by slight fever, and non-infectious.*

2. Under the term of *roseola*, modern writers have described several forms of eruption, which are chiefly symptomatic, and which, in appearance, are intermediate between erythema and urticaria; but more closely allied to the former than to any other eruption. Indeed RAYER doubts as to the propriety of considering roseola as a distinct genus, and of not viewing it as a variety of erythema. Although approaching the appearances of the milder forms of measles and scarlatina, yet the severer, the specific and infectious characters of these, can suggest neither resemblance to, nor alliance with this eruption.

3. I. DESCRIPTION. — This eruption is generally preceded by slight fever and disorder of the digestive organs, for two, three, or even four days, rose-coloured patches then appearing either on parts or over the body. The patches are larger, paler, and less uniform than the spots of measles. They are also more distinct, and are separated from each other by intervals of healthy skin. They are attended by itching and tingling, and frequently disappear in twenty-four or thirty-six hours; but they sometimes subside, and return alternately for seven or eight days. The *varieties* of this eruption have been divided into the *idiopathic* and *symptomatic* — the latter accompanying or complicating other diseases; the former depending upon less obvious changes, although frequently proceeding from disorder of the secreting and excreting functions.

4. i. *Roseola æstiva* is the most severe of the more idiopathic varieties. It is preceded and attended by constitutional disorder, and generally appears first on the arms, face, and neck, spreading in the course of a day or two to the rest of the body, and causing itching and tingling. The patches present the appearances just described, and are at first of a lively red, but soon acquire a deeper tint. The pharynx often presents the same hue, and a roughness or dryness is felt on swallowing. The eruption continues fully out on the second day, but immediately afterwards begins to decline; slight patches of a dull red often con-

tinue to the fourth day, and disappear entirely on the fifth, with the constitutional disturbance. Sometimes the efflorescence is limited to parts of the face or neck, or breast or shoulders; and is very slightly elevated. The patches itch very much; but are without the prickings or stinging of urticaria. They last at most a week; but they occasionally appear and disappear again and again, either owing to violent moral affections, or to spiced food or heating beverages, or to no very manifest cause. The recession of the eruption is often attended by disorder of the digestive organs, or by headach, or by lassitude, which are relieved by the return of the efflorescence. This variety is met with in summer, most frequently in females of irritable temperament, and in delicate persons with an irritable state of the skin. It is often connected with disorder of the digestive canal; and, in its external characters, is intermediate between erythema and urticaria.

5. ii. *Roseola autumnalis* attacks children in the autumn. It appears in the shape of distinct circular or oval spots, of a dusky red colour, that gradually increase until they reach the size of a sixpence or shilling, and are observed chiefly on the arms and legs. The patches sometimes end in desquamation; are not attended by itching or tingling, and rarely continue longer than a week. This variety is evidently very closely allied to, if not a form of, erythema.

6. iii. *Roseola annulata* is attended in some cases by febrile symptoms, and is then of short duration; but, in others, there is little or no constitutional disturbance, and the eruption continues much longer. It appears nearly on every part of the body in the form of rose-coloured rings, of various sizes, the centres of which are of the natural hue of the skin. The rings at first are only a line or two in diameter; but they gradually enlarge to half an inch, or even more. They are less vivid in the morning; but they revive towards evening or night, and are attended with itchiness and tingling. As they vanish or fade, the stomach is disordered; and languor, pains in the limbs, and vertigo, are complained of. In the chronic state of the eruption, the rings have a sallow or discoloured hue, and often recede and recur alternately, thus enduring for weeks, or even months. I agree in the opinion of M. Rayer that this is merely a modification of *erythema annulatum*.

7. iv. *Roseola infantilis* presents spots of small size, and more closely grouped together; so that, looking only at the eruption, and without reference to other, especially the catarrhal symptoms, it may be mistaken for *measles*; but there is less roughness of the surface than in this latter. This mistake has, however, been often made. This variety of roseola attacks children during dentition, or during febrile affections or disorders of the digestive canal. It may occur only for a single night, or it may come and go alternately for several days. It may also appear in succession in different parts of the body. It is accompanied with febrile symptoms, and more or less disorder of the digestive organs. As respects the extent of eruption, and the sensations experienced, this variety closely resembles roseola æstiva.

8. v. *Roseola variolosa* is symptomatic of the natural and inoculated small-pox. M. Rayer states that it precedes the former more rarely than the latter, in which it is calculated to appear about once in fifteen cases, in the course of the second day of the eruptive fever, which corresponds with the ninth or tenth day after the inoculation. The efflorescence is first perceived on the arms, the breast and face, and on the following day extends to the trunk and extremities. The long, irregular and diffused patches leave numerous intervals between them. This variety of roseola is, in a few cases, characterised by an almost generally diffused efflorescence, slightly prominent in some points. It lasts about three days; on the second and third, the variolous pustules may be distinguished amid the roseola efflorescence, by their roundness, prominence, and hardness, and the whiteness of their summits. As soon as the pustules appear, the roseola declines. This variety has been regarded as indicative of an eruption of distinct small-pox; but this is generally not the case; more especially when the roseola is of a deep or dusky tint, and the eruptive fever severe, the small-pox eruption becoming then confluent. The earlier writers mistook this variety of roseola for measles, and concluded that measles were sometimes converted into small-pox. This variety occurs chiefly in persons having a delicate and irritable skin, and is very closely allied to erythema.

9. vi. *Roseola vaccina* is sometimes observed in children from the eighth to the tenth day after the insertion of the vaccine virus. It appears as small confluent spots or patches, or is diffused like variolous roseola, commencing when the areola is formed around the vaccine vesicle, from whence it extends irregularly over the surface of the body. It is accompanied with frequency of the pulse, anxiety and general disturbance; but it occurs less frequently than the variolous variety. It rarely continues longer than two or three days; affects chiefly those of a delicate and irritable skin; and, like the preceding, is intimately allied to erythema.

10. vii. *Roseola febrilis* and *R. miliaris* are merely modifications of erythema, and are, in rare instances only, observed in the course of fevers or accompanying miliary vesicles, especially when those are attended by much perspiration. The patches are of a bright rose-colour, of an oval shape, slightly prominent and smooth, and occur chiefly on the chest and insides of the arms. There is seldom itching. The patches usually disappear after two or three days.

11. viii. *Roseola arthritica* is the appearance of a rose-coloured rash in connection with attacks of *gout* or *rheumatism*. This, however, is only a rare occurrence in this country, the efflorescence either preceding or attending the arthritic disease. Dr. Schönlein has described this variety under the term *Pelliosis rheumatica*; and Dr. Fuchs states, that the rheumatism which is thus complicated is endemic in Würzburg; that it attacks adult males most frequently during winter and spring, when the air is cold and moist; and that the eruption is then oftenest met with. The pains are usually experienced in the articulations and extremities; remit, change their place, are increased by cold, and diminished by the warmth of bed. Gastric symptoms, shiverings followed by febrile reaction, dry and hot skin, loss of appetite, and furred tongue, usher in the eruption, which appears on the second, third, or fourth day after the commencement of these symptoms,

usually at first on the legs, and sometimes going no further, but more frequently coming out on the arms and shoulders at the same time, very rarely on the trunk, and never on the face. The eruption consists of small, distinct spots, varying from the size of a millet seed to that of a lentil, rounded, and of a deep red, or violet red hue. The spots are not so numerous as the vesicles of miliaria, or as the spots of measles. Upon the occurrence of the eruption the fever ceases, and the rheumatic symptoms abate. The spots, whose numbers may be increased by successive crops, grow pale, and terminate by a slight furfuraceous desquamation. The arthritic roseola described by Petzold and Hemming, is similar to that just noticed; but the exanthematous rheumatic fever, which was epidemic in the West Indies in 1827 and 1828, and which was described by Stedman, Nicholson, and Cock, and supposed by Rayer to have been this variety of roseola, was more nearly allied, as regards the eruption, to scarlatina than to roseola; and it moreover appeared to have been, in the opinion of, and according to evidence by these and other writers, an infectious malady.

12. ix. *Rubeola cholerica* is one of the forms of eruption which occasionally appears on the surface of the body during the consecutive fever of the *choleric pestilence*. This variety was first noticed by Dr. Keir at Moscow, and more fully described by Dr. Babington and MM. Duplay and Rayer. But the eruption observed in some cases of this pestilence does not always present the rubeolar characters; for I have observed it to possess, in different cases, more of the appearances of scarlatina, of measles, of nettle-rash, of erythema, and even of erysipelas, with the attendant tumefaction, than of roseola. M. Rayer describes the eruption as occurring most frequently in women, appearing first on the hands and arms, and extending to the neck, breast, abdomen, and lower extremities. At its commencement the spots were of an irregularly circular form, of a bright red colour, elevated above the surface, and but slightly itchy. They were most numerous on the hands, arms, and chest; and in some places they were crowded, or almost confluent, more especially on the chest, where they sometimes formed, by their confluence, patches as large as the hand, somewhat raised, and well defined. The eruption then presented a dirty pink, or rose colour. About the sixth or seventh day, the epidermis cracked, and was thrown off in large scales, where the eruption had existed. M. Rayer has seen this eruption complicated with inflammatory affection of the fauces and tonsils, and its disappearance followed by an aggravation of the symptoms, and sometimes even by death.

13. II. Diagnosis.—*a*. Roseola, especially the varieties autumnalis and annulata, is distinguished with difficulty from *erythema*. In both kinds of eruption, the patches are irregular and uniform in tint; but are generally smaller in roseola than in erythema. When the febrile disturbance of the former is well marked, and the patches of eruption dispersed over the body, then the diagnosis between it and the latter will not be difficult. — *b*. Roseola æstiva, and R. infantilis, most closely resemble the eruption of *measles*, for which they have been often mistaken; but the absence of catarrhal symptoms, the less degree of fever, the larger size and more irregular form of the patches, the progressive advance of the patches from the extremities to the trunk, and their uniform redness, distinguish these varieties from the punctiform appearance of the eruption of measles. The infectious and often epidemic nature of the latter should also be taken into account. Sydenham considered roseola to be a variety of measles, and several other writers believed that the former was only a spurious variety of the latter. Hoffmann, Borsieri, and Selle, pointed out the difference, and contended that roseola was an exanthem sui generis, and distinct from the other exanthemata. — *c*. Roseola may be distinguished from *scarlatina* by some of the circumstances just adduced; but more especially by the severity of the constitutional symptoms, and the state of the throat and tongue. — *d*. The light-coloured and raised spots and wheals of *urticaria* can hardly be mistaken for the more uniformly red patches of roseola. The itchings, tinglings, prickings, and stingings, are much more severe and generally experienced in the former than in the latter.

14. III. Causes. — Roseola occurs chiefly in children, in females, and persons of a delicate constitution, or irritable temperament. It is generally occasioned in infants and children by teething and irritation of the digestive canal. In adults it is most frequently caused by errors of diet or regimen, especially during summer and autumn; by hot spices; by overheating the body by exercise or exertion; by drinking cold fluids, or exposure to cold air when the body is perspiring; by eating shell-fish, or other indigestible substances; by acid fruits, pickles, preserves, &c.; by heating or exciting beverages; and by whatever irritates the stomach or bowels. It may be symptomatic of a morbid state of the blood consequent upon impaired or interrupted secretion and excretion, especially from the skin, liver, or kidneys; and in females from the uterus.

15. IV. Treatment. — This eruption requires but little treatment beyond the removal of the causes, remote and pathological, as far as they may be manifest, and the due promotion of the secretions and excretions. When the eruption occurs in the course of acute or constitutional disease it should be viewed as critical, and be interfered with as little as possible. When it affects children, small doses of hydrargyrum cum creta, soda, and rhubarb; or simply the grey powder and magnesia, followed after two or three doses, by a little castor oil, will generally be sufficient to remove it; and if the gums be hot or swollen, and the state or period of dentition suggest the operation, scarifying the gums will be of service. In some cases, the liquor ammoniæ acetatis with spiritus ætheris nitrici, in camphor water, or in any other suitable vehicle, will be of further benefit. In adults, after duly evacuating the bowels, and promoting the alvine secretions, tonic infusions or decoctions, with nitre and alkaline sub-carbonates, will be taken with immediate advantage. When there is much itching and tingling of the skin, a tepid, or warm bath will give relief. When any of the excretions are disordered — whether the biliary, the intestinal or the urinary, — the treatment should be directed accordingly; and, if menstruation is difficult, painful, or scanty, the biborate of soda may be given with an aloetic preparation and the compound galbanum pill, and when the eruption has disappeared, the mistura ferri compositæ, or

other preparations of iron, may be taken in such combinations as the peculiarities of the case will suggest. The more obviously symptomatic varieties of roseola should be treated according to the nature of the disease, of which it is merely a sympathetic, and generally a not very important manifestation, unless when it assumes a deep or dark hue, and then there is a manifest indication for the employment of tonic and restorative means. The *diet* should be light, chiefly farinaceous, and moderate; and the regimen in other respects antiphlogistic.

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RUBEOLA. — SYNON. — *Morbilli scarlatinosi, Scarlatina morbillosa, Scarlatina hybrida*; — *Morbilli, Scarlatina, Roseola, Rossania*, Auct. Var.; — *Rougeole, fausse rougeole*, Fr.; — *Röthein, Feuermasern*, Germ.; — *Rosalia*, Ital.; — *Bastard measles, Bastard scarlatina, hybrid measles or scarlet fever.*

CLASSIF.—III. CLASS. III. ORDER. (*Author*).

1. DEFIN. — *Fever attended by coryza, redness and watering of the eyes, redness and soreness of the throat, pains in the head, back, and limbs, attended on the third or fourth day by the sudden and general eruption of a red efflorescence, which terminates about the tenth day in desquamation; the disease presenting the characters of measles and scarlet fever conjoined.*

2. It is doubtful whether or not this should be viewed as a distinct or specific form of disease, or merely a variety of either measles or of scarlet fever, in which many of the characters of either the one or of the other predominate. I have, as will already appear, considered it as a hybrid, combining the chief characteristics of both these exanthemata. Since the days of the Arabian writers, until recent times, certain of the exanthematous fevers were considered as being merely modifications of the same disease; and it was only as late as the close of the last century that the distinctions between scarlet fever and measles were fully determined and generally recognised. More recently still the differences have been more absolutely believed in, than an extended and diversified experience warrants; for the medical writings of the 17th and 18th centuries contain the histories of epidemics, which, according to the descriptions they furnish, present characters which belong both to measles and to scarlet fever. The experience of physicians, also, that has been prolonged through a number of years, or been extended to different countries, has furnished instances of either sporadic cases, or of prevailing and malignant epidemics, in which some, if not the majority, of the cases have presented the mixed features of measles and scarlatina. Even the notices of measles contained in the works of RHAZES and other Arabian physicians, furnish indications that this form of disease, to which the term rubeola has been applied by myself and others, was actually known to them, they viewing it as a variety of measles; although they afford no distinct proofs of an acquaintance with scarlatina.

3. From the description which J. FRANK has given, it is evident that he misapplies the term rubeola to the more general and severe forms of roseola; and M. RAYER appears to entertain a similar opinion. Indeed the French writers use the word rubeola either with reference to measles or to roseola, to the former especially, and have not recognised this hybrid malady, which has engaged the attention of so many German writers since the commencement of the present century, and whose existence clears up many of the difficulties which present themselves on reading the accounts of epidemics that have possessed the mixed characters of this malady. — RICHTER and HILDENBRAND have defined Rubeola to be a species between measles and scarlet fever. The latter writer states "that *Rubeola* holds a place between measles and scarlet fever, the name being derived from its deep red colour. Authors differ much as to its nature, and have applied the term indiscriminately to measles and to other species of exanthem. Neither in France, nor in Italy, are these names appropriate to measles and to rubeola individually; *rougeole*, in the former country, and *rosolia*, in the latter, being applied indiscriminately to both." The Arabian writers viewed the eruption to which recent German writers have applied the name *rubeola* as a variety or modification of measles; and at a much later period INGRASSIAS, FORESTUS, BALLONIUS, SENNERTUS, and others, have so confounded rubeola with scarlet fever, as that the accounts they have given are equally applicable to either species of disease, owing both to their short and imperfect descriptions, and to their arbitrary or indiscriminating use of the terms rubeola and scarlatina. Towards the close of the last century, SELLE described measles (morbilli) and rubeola as distinct affections, and during the commencement of the present century, several German writers, especially ZIEGLER, REIL, FIELITZ, JAHN, HUFELAND, SCHÆFFER, FORMEY, FLEISCH, and HEIM, have given correct descriptions of epidemic rubeola.

4. I. DESCRIPTION. — (*a.*) During the *febrile stage*, rubeola furnishes most of the catarrhal and febrile symptoms observed at the commencement of measles and scarlet fever: a defluxion from the nostrils, redness of the eyes, frontal headach, cough, watering of the eyes, great heat and dryness of the skin. Sometimes rheumatic pains, retchings, somnolence, dull headach, itching of the eyes, are observed to precede the eruption. Inflammatory redness of the fauces, tonsils, and pendulous velum of the palate, is never absent unless in the slightest cases. According to HEIM patients emit a similar odour to that exhaled by those affected by scarlet fever.

5. (*b.*) On the third or fourth day an *eruption* or exanthem breaks out over the whole body, as if at a single effort. It is however more scanty on the face; and it presents two forms, the one consisting of red spots, with irregular margins, varying from a line to a line and a half in diameter, and remaining distinct throughout their course; the other of red spots, of the size of millet seeds,

possessing no distinct margins, and becoming paler from the centre to the circumference. In mild cases, the efflorescence is discrete; but in the severer cases, it is much more abundant, and the spots larger, being about two lines in diameter; so that, on the second day of the eruption, it imparts to the whole surface a deep and almost equal red colour. Rubeola may now be readily mistaken for scarlatina; but it may be distinguished by the circumstance of the red spots being different from the scarlatinous exanthem, those pressed on by the finger becoming pale, but very quickly regaining their red hue from their centres to their circumferences. The general redness of rubeola, which equals that of scarlatina, fades after two days, the spots still remaining, and small miliary phlyctenæ appear and impart a roughness to the skin, and become filled with a little whitish and thick fluid. During the eruption the constitutional symptoms of the first stage are increased, and others often supervene, as hoarseness, or loss of voice, severe cough, oppression in the chest, vomiting, delirium, or convulsions in young subjects. After the eruption has come fully out, which takes place within twenty-four hours, it continues from six to ten days, retaining its assigned form, and the anginous and febrile symptoms undergo a marked diminution, unless when the affection of the throat becomes aggravated, which sometimes occurs.

6. (*c.*) About the tenth day from the commencement of the disease, the eruption becomes pale and disappears, *desquamation* supervening in proportion as this change proceeds, the anginous and febrile symptoms equally subsiding with the progress of desquamation. This change is often connected with a critical evacuation, as sweats, hypostatic urine, epistaxis, &c. Desquamation proceeds from the centre of each spot, the scales presenting a round or stellated appearance, and without any unpleasant sense of itching.

7. (*d.*) In the most unfavourable cases, rubeola either *terminates* in death, owing to the same circumstances and changes as are observed in measles or scarlet fever, or occasions those visceral affections and their consequences, which are described in connection with these maladies, and which often render the ultimate issue doubtful. Of these consecutive affections, the most frequent are those of the respiratory passages and lungs; of the glands, and of the digestive and urinary organs; and dropsy, especially anarsaca. Rubeola, although frequently a mild, is sometimes a most severe or even dangerous malady, especially when it is epidemic. The epidemics described by SELLE presented a malignant character, and were fatal to many; and that noticed by FORMEY was of a putro-adymic kind, and was very fatal in Berlin.

8. II. NATURE.—Several authors believe rubeola to be a specific contagious disease, and therefore belonging to the class of pestilential fevers. Some, however, consider it a variety of one or other of the diseases which it so closely resembles—of either measles or scarlatina. HILDENBRAND states "that some consider it with HUFELAND, SHÄFFER, FORMÄY, and HEIM, as a variety of scarlatina; and that KAPP, WICHMANN, and REIL view it rather as allied to measles; whilst UEBERLACHER, JAHN, and FLEISCH believe that no essential difference exists between measles, rubeola, and scarlet fever." According to this last opinion, rubeola should be viewed as the connecting link between measles and scarlet fever. That rubeola, on the one hand, is very nearly allied to scarlatina, is shown by the affection of the throat, by the intense redness of the skin, by the mode of desquamation, by the peculiar odour proceeding from the patient, by the contemporary existence of both forms of exanthem in different persons in the same locality and by the consecutive appearance of dropsy in some instances; but that rubeola, on the other hand, is equally allied to measles is shown, by the catarrhal symptoms—by the coryza, cough, watering of the eyes, andhoarseness; by the form of the segregated spots, forming a part of the eruption, and by the occasional prevalence of it at the same times and places as measles, as HILDENBRAND states that he had himself observed. Many writers further allege, as proofs that rubeola is merely a variety of measles, the belief in scarlatina being a comparatively recent disease, whilst notices of rubeola are found in connection with measles in the writings of the Arabian physicians. I believe that rubeola is not a disease, *sui generis*, nor yet a modification merely of either measles or of scarlet fever, but a hybrid of these two fevers, presenting sometimes a predominance of the symptoms characteristic of the one, at other times of those distinguishing the other, and not infrequently an equal combination of the features of both. In this opinion I differ little from that held by HILDENBRAND. REIL believed rubeola to be a species of exanthem between measles and scarlet fever whilst MARCUS considered it to hold the same relation to both these exanthems as exists between true and spurious small-pox. But it may be asked, to what cause can this hybrid state of disease be imputed? Can the copulation of measles and scarlet fever be assigned to epidemic states of the air, or epidemic constitution, or to the conditions of season or weather? Or may it be considered an accidental combination, or a coincident appearance of both maladies, in an epidemic form, at the same time, and amongst the same population, the characteristic features of either malady predominating according to the predisposition, constitution, &c. of the individuals affected? This latter view appears by no means unreasonable, although the dogma of JOHN HUNTER, so long believed in, but now disproved, that two diseases cannot exist in the human œconomy at one time, may still appear to some, but without sufficient reason, to militate against it (See MEASLES, § 48.)

9. III. TREATMENT. — The treatment of rubeola must entirely depend upon the type or character it assumes, either sporadically or epidemically; and hence the principles of treatment assigned to such types of the diseases of which it is the hybrid — of measles and of scarlet fever, — should guide the physician in his treatment of this mixed malady. When the disease is mild, then our means should also be mild, and be directed chiefly to the promotion of the secretions and excretions —and consist chiefly of cooling diaphoretics and aperients, and of diuretics; avoiding at the same time all causes, both intrinsic and extrinsic, that may favour the supervention of internal complications, or of unfavourable sequelæ, and restoring and promoting the functions of the skin by external warmth and other means which circumstances may require. When the type of the disease is truly inflammatory, then antiphlogistic

measures should be prescribed, but with the recollection that however inflammatory it may appear, that it is generally characterised by more or less asthenia, and by an obviously morbid state of the blood, pathological conditions requiring much circumspection as well as decision in the choice and administration of our means of cure. If, on the other hand, the disease assumes adynamic, nervous, septic or putrid characters — features of more or less malignity, — as observed in some of the epidemics which have appeared on the Continent, remedies of a tonic, restorative, astringent, stimulant, antiseptic, or alterative nature, should be prescribed; combining, varying, or adapting each and several of these to the pathological conditions of individual cases, as I have attempted to illustrate when discussing the treatment of Measles, and of Scarlet-fever.

Bibliog. and Refer. — See the works of *Rhases*, *Ingassias*, *Sennert*, *Baillou*, &c. — *Orlow*, Programma de Rubeolarum et Morbillorum Discrimine, Königsb. 1758. — *G. F. A. Ziegler*, Beobachtungen aus der Arzneywissenschaft, &c. Leips. 1788. p. 81. — *Selle*, Medicina Clinica, 2d ed. p. 171. — *Jahn*, Neues System d. Kinderkrankh, p. 446. — *Fleisch*, Handb. ueb. d. Krankh. der Kinder, b. ii. p. 200. — *D. A. G. Richter*, Die Specielle Therapie, &c. b. ii. p. 517. — *Formey*, Topographie von Berlin, 1796. — *Reil*, Memorab. Clinica, vol. ii. p. 12. — *Strohmayer*, Dissert. de Rubeolarum et Morbillorum Differentia, Götting. 1806. — *Hufeland*, Ueb. die Rötheln, in S. Journ. 1811. st. 6. p. 15. — *Fielitz*, Beobacht. einer Rötheln-epidemie, in ibid. b. iv. st. 2. p. 199. — *Heim*, Bemerk. über die Verschiedenheit des Scharlachs, der Rötheln u. Masern, vorzüglich in diagnostischer Hinsicht, in ibid. 1812, b. vii. st. 3. p. 60. — *P. Ab Hagen*, Dissert. de Rubeolis, Götting. 1812. — *J. J. Schneider*, Beobacht. einer Rötheln-epidemie, in Adversaria, &c. b. i. pp. 180—203. — *V. N. Ab Hildenbrand*, Institutiones Practico-Medicæ, &c. t. iv. p. 412. — *Gallisch*, Tractat. de Rubeola, Wien. 1823. — *D. Wömpner*, Dissert. de Rubeola, Rostock, 1827. — *F. Krausse*, Dissert. de Rubeolis, Berl., 1828. — *Wagner*, Die Rötheln als für sich bestekende Krankheit, in *Heckers*, Litterar. Annalen. 1829. Hft. 4. p. 420. — *M. E. A. Naumann*, Handbuch der Medicinischen Klinik. b. iii. abth. i. p. 818.

RUMINATION. — Synon. — *Ruminatio humana; Human rumination; Merycismus* (μηρυκισμὸς, *ruminatio*); *Mérycisme*, Fr.; — *das Wiederkäuen*, Germ: —

Classif. — I. Class. — I. Order. (*Author.*)

1. Defin. — *The regurgitation of food, which had passed into the stomach, and which is remasticated and again swallowed.*

2. This affection is of rare occurrence, especially in a *simple* and *complete form*. It is much less rare as an *occasional, incomplete*, and *associated occurrence*; and in alliance with some form or other of dyspepsia.

3. I. History of. — It is difficult to determine whether or not this affection, — for it may not be called a disease, seeing that it is attended by considerable enjoyment, — was known to the ancients. When we consider the habits and luxurious indulgences of the civilized and wealthy amongst the Greeks and Romans, and the means which the most notorious gourmands, in their respective eras of luxury, employed to unload the stomach in order that a second gratification of the palate should be entered upon, it may be inferred that this affection would have been viewed as a source of supreme gratification; and as one to be indulged in or cultivated, and not one to be got rid of. And probably the enjoyment would not have been marred even if a similar opinion had been entertained by their physicians to that promulgated by honest Fabricius ab Aquapendente, who believed that the human subjects of this affection are endowed with a double stomach, and that other bestial endowments might, in process of time, appear in them or in their descendants.

b. Galen must have had ample opportunities of observation amongst the cases of indigestion he could not fail of having met with in the luxurious but peaceful court of the Antonines, yet he does not furnish us with a single instance of rumination; and amid the various stomach-aches and affections of Marcus Aurelius, which both puzzled the brain and caused the anxiety of this immortal physician to such a degree as to make him afraid that a glass of spiced wine might be too hazardous a remedy for the good emperor, the faculty of regurgitating his food for a second mastication appears not to have entered into the number; unless we suppose that, this not being considered a disease, the interference of Galen was not required, upon the ground that matters of taste, in the animal as well as in the mental application of the word, give a heightened enjoyment by their deliberate rumination.

5. Fabricius has furnished two of the earliest instances of human rumination on record. The first was that of a nobleman, in whom it generally took place an hour after his meals; which, whether solid or fluid, were always returned to undergo a second and more deliberate mastication. Fabricius has thought it just to mention, that the father of this person had a horn growing from his forehead; and with great good faith has added, "ex quo forte datur nobis intelligi, parentis semen aliquam habuisse cum cornugeris animalibus, neque mirum fuisse genitum filium simile, quid a parente contraxisse," — that, although the son did not inherit his father's horns, yet he possessed the accompanying faculty of rumination.

6. The second instance, with which honest Fabricius has favoured us, was in a monk, who, although possessed of a most ravenous appetite, died of marasmus. This monk combined the bestial attributes of both the father and son just mentioned; for, in addition to his faculty of rumination, he had his forehead adorned with two horns, which, in a monk, he avers was the more singular. John Burgower, who visited this monk, in the company of Joseph Prevot and Thomas Minadous, wrote a volume on this very illustrious person, and furnished Fabricius with the particulars which are inserted in his works. Burgower also adds that the brother of this monk was also adorned with two budding horns, — "duorum cornuum vestigia gestasse," as a striking feature of family likeness; or, as this author will have it, "quod enim fratris erat, id monacho ruminanti simul gratis impertiunt." But this interesting individual did not ruminate, unhappily for the argument of Thomas Bartholin, who, from these two instances, has hastened to the conclusion, with true medical logic, and with faithful dependence upon the obvious analogy of the "cornugeræ pecudes," that all human ruminants are adorned with horns; and has also averred, with equal truth, that they will be found, on dissection, to be possessed of a double stomach. This interesting doctrine cost the laborious Conrad Pyer no small trouble to refute: and he has concluded in his turn, taking his honour to witness (for he has treated the subject with great gravity)

that this did not agree with his experience, for there are many horned individuals who do not ruminate.

7. DANIEL SENNERT has furnished an account of a man of forty who possessed the ruminating faculty from a child. He found no difficulty in accounting for the existence of this affection in that instance, when he learnt that this individual, when an infant, had lost his mother, and been fed during his nonage with the milk warm from a cow. SENNERT accordingly, more soberly than legitimately, concludes, that he sucked it in with his nurse's milk:—"Quamobrem deficiente educatione, cum orbus infans, et institutionis humanæ inops nutricem vaccam observaverit tuereturque attentius, ipse ruminationi paullatim assuevit, sodalitii familiaritate degenerans, &c.!"—PHILIP SALMUTH has adduced a case of human rumination which he observed, and stated a fact illustrative of its cause, that is met with in most human ruminants. The subject of the affection ate ravenously, swallowed his food after very imperfect mastication, and ruminated about a quarter of an hour after leaving table.

8. JOSEPH FABER LYNCEUS has immortalized the highly respectable ANTHONY RECCHI, who, dinner being concluded, and seated over his cups with his friends, was always obliged to retire, about half an hour after the meal, into a remote corner of the apartment, and then ruminated the ingesta, undisturbedly, and as quickly as possible; which having done, he enjoyed uninterruptedly the society of his friends. "Having been asked how he became obliged to indulge this propensity, he answered that, from a boy he had been subject to acid eructations; and that, after having reached his thirtieth year, he found it impossible to resist admitting into his mouth the food that constantly regurgitated from his stomach. Being further interrogated whether the second mastication of his food afforded him any gratification, 'Indeed,' he replied, 'it is sweeter than honey, and accompanied with a more delightful relish.' This affection might be said to have been in the family of the distinguished RECCHI; for he was blessed with two grown sons, the elder of whom was also endowed with this delightful faculty, but had it more under control than the father, as he could prevent it altogether when in company. The younger son had not then come to its possession.

9. G. H. VELSCH has recorded the case of an inhabitant of London, who, in the fortieth year of his age, and of sound health, always returned his food to undergo a more deliberate mastication. Rumination always took place in this person from one to two hours after a meal; and even at the second hour it still preserved a pleasant taste, and was without any degree of acidity. This, however, was not the case with a young woman seen by DANIEL LUDOVIC, for she returned her food with insufficient pleasure; and the regurgitated matters were often possessed of a disagreeable taste. He states that bitters and stomachic purgatives did not remove this affection, which, however, was not always regular in its occurrence; and although emetics and cathartics prevented it for a short time, it soon returned. With all due respect for DANIEL LUDOVIC I consider this affection more allied to apepsia, than to rumination, or as a state intermediate between them.

10. JOSEPH CONRAD PYER has recorded three cases of this affection, one of the subjects of which was idiotic, one was a female, and the three were rustics; and he sagely endeavours to prove, from the circumstance of these persons having been rustics and cowherds, that the frequent sight of the ruminating process had impressed their brains with a similar propensity, which, although at first imperceptible, had nevertheless ripened into maturity. SLARE has recorded, in the *Philosophical Transactions*, at a time when the Royal Society was less fastidious as to the publication of papers, the case of a Bristol man who ruminated not only the more solid ingesta, but also fluids, as milk and soups. But, amid such imperfect information as philosophers in those days were quite satisfied with, I find it stated that his victuals always seemed to descend imperfectly into the stomach, and to lie in the lower part of the throat. However, the portion first taken was the first ruminated. Nevertheless, I suspect that this case was one of sacculated œsophagus similar to those which have been more recently published by my friend WORTHINGTON and others.

11. More recently several cases of human rumination have been recorded by MM. TARRES, PERCY, LAURENT, CULLERIER, and still more recently by M. RICHE, SCHMIDTMANN, and myself. The first case which came under my observation was treated in 1819 and 1820, and the history of it fully detailed in the forty-fifth volume of the *London Medical and Physical Journal*. The subject of it is still (1848) alive and in good health. Since the publication of that case, two others, one of them in a medical man, have been treated by me; and I have had reason to believe that instances of partial or occasional rumination are not so rare in the human subject as is generally supposed.

12. II. SYMPTOMS.—The cases of this affection, which I have seen, were of several years' duration before they came under my care. The affection was stated to have been partial or occasional at first, and had become more constant and complete by neglect and indulgence, and by the habit of quick or voracious eating. The *symptoms* of the fully developed case, which continued for some time under my care, were as follows:—The patient was a married man of about twenty-seven or twenty-eight years of age. Rumination took place after all his principal meals. His appetite was always good, and his food was taken in large mouthfuls, was masticated hastily and imperfectly, and swallowed eagerly, chiefly in order to resume his avocations. There was no thirst. His bowels were habitually costive. His sleep was sound.

13. Usually rumination commenced from a quarter of an hour to an hour after a meal. At its commencement, a sense of fulness was felt at the cardia, followed by a fuller inspiration than usual. As soon as inspiration was completed, a bolus of the unchanged food rose rapidly from the stomach, during the expiratory act, or preceding this act; and so rapidly did expiration succeed to regurgitation of the alimentary bolus, that the latter appeared as part of the expiratory act. The ruminating process was never accompanied, at any time, with any degree of nausea, nor with pain or disagreeable sensation. The returned alimentary bolus was attended by no unpleasant flavour, was in no degree acidulous, was equally agreeable, and was masticated with greater plea-

sure, and much more deliberately, than when first taken.

14. The whole of the food taken at any one meal was not thus returned for remastication, only the part which had undergone this process insufficiently, and which often constituted the greater part of the aliment. That taken at the commencement of a meal was generally first disgorged; but this order was sometimes not observed, much depending upon the articles partaken of and their comparative degrees of comminution and digestibility. The more fluid portions of a meal were not always returned unless along with the more solid or imperfectly masticated parts; and it was often then observed, if a considerable time had elapsed from their deglutition, that the former was more or less acid, whilst the latter possessed the same taste and flavour as when first swallowed. When the stomach was distended suddenly by a large meal, the fluid as well as the more solid contents were generally regurgitated and again swallowed after more or less mastication.

15. In this case, as well as in the others, this affection appeared to have been partially under the control of the will; for, although it sometimes took place when the mind was merely unconscious of the process, yet it never occurred when the individual was sound asleep. If sleep supervened soon after a meal, either it was broken by the occurrence of the ruminating process, or it prevented this process, particularly if it continued for some time. In this latter case, acrid eructations, flatulence, &c. took place, owing to the gastric juices being insufficient for the imperfectly masticated ingesta. Sometimes, when the ruminating process was thus prevented, or voluntarily suppressed, the ingesta were not returned until after some hours; but were then acid, often acrid and bitter, and were occasionally regurgitated in so large a quantity as to fill, or even as more than to fill, the mouth. This, however, was unattended by cardialgia, or gastrodynia, or by any feeling of nausea; and even these disgorged matters were attempted to be remasticated, although more generally thrown out on account of their disagreeable taste. In a case related by M. CULLERIER, the subject of it ruminated only when he was urgently pressed by his occupations and ate his meals in a few minutes, with little mastication. On becoming more at leisure, and being able to pass an hour at table, he ceased to ruminate. Human rumination is to a certain degree an involuntary act, and yet the individual has certainly the power of hastening or suspending it to a certain extent.

16. *Dissections* have not thrown any light on this affection. Nor can it be expected that, even in the event of sudden death taking place in a ruminating subject, any very manifest alteration of structure would be found. FABRICIUS and BARTHOLINUS were confident of finding two stomachs at least in ruminating persons, from the analogy of the cornuted animals! PYER and MORGAGNI justly ridiculed the idea, and argued that there were animals which ruminated without a double stomach. The first instance, in which inspection after death was made was in the case of the monk already alluded to. It was made by Francis PLAZZONI, and is related by RHODIUS and BONET, the former of whom states,—"Monachus cum voluptate cibum ruminavit. Medici brutorum more genuino ventriculo præditum putabant. Ipso defuncto, F. PLAZZONUS œsophagum reperit undiquaque carnosum instar musculi, reliquis universi corporis partibus se recte habentibus." The physicians of the seventeenth century were not much enlightened by the opening of this monk, but their dreams of the existence of two stomachs were henceforth dissipated. J. P. FRANK mentions the case of an old hypochondriacal pharmaceutist who ruminated for forty years. He died greatly emaciated, and on dissection the pancreas was found scirrhous. In a case noticed by BONET, the only change observed after death was the very great size of the stomach and the rough or corrugated state of its villous surface.

17. III. CAUSES.—The *predisposing causes* of this affection in man are manifestly debility of the stomach with increased organic sensibility, and an insufficient secretion of the gastric juices for the quantity and state of the ingesta. The *exciting cause* is manifestly an imperfectly divided, and insufficiently masticated and insalivated condition of the more solid food, together with a too rapid distension of the stomach. Probably the former would be insufficient to excite the affection without the latter, otherwise the numerous persons who are incapable sufficiently to masticate their food, owing to the state or the want of their teeth, would be much more liable to this disorder than we find to be the case. It is not unlikely that more depends upon the state of the organic sensibility and contractility of the stomach, especially at its cardiac opening, than upon the other conditions singly now mentioned. It is most probable that, as the more digested and digestible matters are propelled towards the pylorus, the least divided or masticated aliments irritate the cardia, and thus, by a reflex action, originating in the stomach, or rather in this region of the stomach only, regurgitate or propel a portion of the unmasticated contents upwards and along the œsophagus to the mouth for their better preparation. As digestion commences and proceeds and the stomach contracts, the chyme or more altered parts are propelled to the pylorus, and the least prepared or least soluble parts are thereby placed nearer the cardia, whence they are simply regurgitated and remasticated, or where they occasion, according to the states of the organ, or the states of their preparation in the mouth, or their nature, if not rumination, partial or complete, acrid eructations or cardialgia, or any other form of indigestion.

18. IV. TREATMENT.—This affection should be treated simply as a form of indigestion, due attention being paid to the state of the biliary secretions, and indeed to all the secretions and excretions. But the means of cure will frequently fail if the patient neglect to take his meals deliberately, and masticate his food sufficiently, or if he take more than his digestive powers can duly dispose of. In the cases which occurred in my practice, a grain of ipecacuanha with a sufficient quantity of the pilula aloës cum myrrhâ, or of the extractum aloës purif. to preserve the bowels open, was given twice daily, and a tonic draught about an hour before dinner; or only the pills prescribed in the Appendix (*Form* 558.). These were aided by warm salt-water bathing, followed by frictions of the surface; by cold sea-bathing, or the cold shower-bath; by attention to diet, by eating in moderation, and by masticating deliberately. In other re-

spects, and according to the associations which this affection may present in practice, the treatment is altogether the same as is recommended in the article INDIGESTION.*

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RUPIA. — SYNON. — *Ulcus atonicum, Ecphlysis Rhypia* (Good); — *Rhyparia; Rupia* (from ῥύπος, filth); — *Phlyzacia*, Alibert; — *Atonic ulcer.*

CLASSIF. — *Order* 6th. Vesicular eruptions. *Genus* 4th. Offensive vesicular eruption (Willan and Bateman). IV. CLASS. IV. ORDER. (*Author*).

1. DEFIN. — *An eruption of small, flattened, and distinct bullæ, surrounded by inflamed areolæ, filled with a serous, puriform, sanious, or dark bloody fluid, and followed by thick, prominent, dark-coloured scabs, covering unhealthy ulcers.*

2. I. DESCRIPTION. — This eruption is observed chiefly in delicate, debilitated, or cachectic constitutions. It is so closely allied to *Pemphigus* as to justify the arrangement of both as species of the same genus. Most of the recent writers on diseases of the skin have described three varieties of rupia, namely, *Rupia simplex, R. prominens*, and *R. escharotica.*

3. i. *Rupia simplex* commonly appears on the legs, sometimes on the loins or thighs, and seldom on other parts. It commences with one or more flattened, isolated bullæ, varying from the size of a sixpence to that of a shilling, that contain at first a transparent serous fluid, which soon becomes turbid and purulent. This fluid grows consistent, and is finally changed into scabs of a chocolate colour, thicker in their centres than in their circumferences, the outer layer being continuous with the epidermis, which appears detached at the margins by the fluid underneath. Under the scabs, which are detached within a few days, the skin is found excoriated or ulcerated superficially. The sore, if left to itself, either heals up, or is more frequently covered by another scab, which is thrown off at a later period; and thus the process may be repeated for several times. When the ulcer heals, the part retains, for a very long time, a livid or deep red hue.

4. ii. *Rupia prominens* presents larger bullæ than the preceding, and the scabs are thicker, and the ulceration underneath is deeper. Each bulla is preceded by a circular red spot, over which the cuticle is detached and slowly raised by a dark thick fluid, which soon concretes into a scab, the thickness and size of which increase for some days afterwards. The circumference of the scab is surrounded by a reddish border, a few lines in breadth, the epidermis of which is raised by a serous fluid, which forms a new incrustation, adding to the extent of that already produced. The areola also increases in breadth, around the base of the scab, which itself increases in breadth and thickness, during three or four, or even during seven or eight days. When the diameter of the scale is large it resembles the outer surface of the convex shell of an oyster; but in this variety, the incrustation projects in the same degree as it spreads, becomes conical, and resembles the shell of a limpet. The scab adheres firmly, and generally requires emollient applications to facilitate its removal. When it is removed, the surface underneath the scab appears ulcerated more or less in extent and depth. If the part remain exposed to the air, either a new crust or scab is formed, or ulceration extends more deeply and spreads until it approaches the breadth of a half-crown, or crown-piece. The ulcerated surface is pale and readily bleeds. The atonic ulcers thus produced heal very slowly; and the cicatrices which they leave retain for a long time a brownish livid hue, and are liable to break open afresh.

5. iii. *Rupia escharotica* occurs chiefly in cachectic children and infants, and occasionally in aged persons, or in adults who have suffered severely from chronic rheumatism, or constitutional syphilis. It commonly appears on the legs, the thighs, the scrotum, the abdomen, the upper part of the chest and neck; but it rarely is seen on the upper extremities. This variety, in infants, is almost, if not altogether, identical with *pemphigus infantilis* (see PEMPHIGUS, § 9.). It begins by one or two red and livid spots, over which the cuticle is soon raised, by the effusion underneath it, of a serous or sero-sanguinolent fluid. The bullæ thus formed go on increasing in an irregular manner; the serum they contain becomes turbid, and of a blackish hue; they afterwards

* SAUVAGES adduces an interesting case of human rumination which occurred in a rustic, who accelerated and promoted the ruminating process, or rather the regurgitation of his food for remastication, by pressure over the stomach. After thus promoting at will this process, and resorting to it for several years, without any detriment to his health, his Confessor admonished him against it. But rumination continuing, notwithstanding the means employed to promote it were laid aside, he was told to reject the regurgitated food. He did so for a fortnight, but he became so debilitated that he had recourse to medical aid. His physician advised him to instantly re-swallow the substances which were regurgitated, without submitting them to a second mastication, and prescribed for him tonics, stomachics and aperients; and after a few days he was freed from his rumination and all his ailments.

break, and the dermis, left exposed, appears ulcerated, softened or gangrenous, in different points. A bloody and an offensive sanies bathes the surface of the sore, the edges of which are livid, but not very painful. In infants the bullæ do not generally reach so large a size as those in adults, but they follow each other in greater numbers; the sores becoming painful, causing fever and sleeplessness, and even fatal exhaustion in the course of two or three weeks. In adults, this variety sometimes acquire the dimensions of rupia prominens, and small portions of skin and cellular substance often sphacelate, and are detached slowly from the ulcerated surfaces. In every instance cicatrization is tardy, restoration being often arrested or stationary for a time. This variety is always attended by marked constitutional disturbance.

6. Rupia is sometimes *complicated*. *R. simplex* is frequently associated with *ecthyma*, or with *scabies*. The other varieties are occasionally complicated with *purpura*, or with the cachexia produced by very chronic rheumatism, by constitutional syphilis, and by long-neglected disorder of the digestive, assimilating, and excreting organs.

7. II. DIAGNOSIS.—Rupia can be confounded only with ecthyma and pemphigus.—(*a.*) *Ecthyma* differs from rupia in being a pustular eruption from its first appearance. The highly inflamed areola surrounding the pustules, and the hardness, small size, the embedded position, and the closer adherence of the scabs, further distinguish ecthyma.—(*b.*) Rupia is distinguished from *pemphigus* by the smaller size and flatness of the bullæ; by the turbid and sanguinolent contents, as contrasted with the usually limpid and transparent fluid of pemphigus; by the thick, rugous, and imbricated scabs; and by the ulcerations of various extent and depth.

8. III. CAUSES.—Scrofulous children; the offspring of debilitated, drunken or dissipated parents; and persons who have been weakened or exhausted by depressing causes, by sickness and unwholesome food, are the most frequently the subjects of this eruption. It appears, especially during the winter, amongst the insufficiently clothed and fed, and among those who neglect personal cleanliness, and who live in low cellars, or in close, crowded, and ill-ventilated places or apartments. It is also liable to occur during convalescence from small-pox, scarlatina, measles, &c.; and in both young and aged, who are the subjects of some degree of anæmia in connection with impaired excretion. Its association with cachexia, especially as an effect of this state of the frame, and of constitutional syphilis, in some other instances, is a circumstance of great importance in forming our intentions, and in selecting our means of cure.

9. IV. PROGNOSIS.—Rupia is not in itself a dangerous, although often an obstinate, and, when the eruption is abundant, a serious disease. When it appears on the legs, the ulcers are always intractable. The duration of rupia cannot be stated with precision; but it is always chronic, and often very protracted; much, however, depends upon the age and constitution of the patient; the number, the size, and the situation of the bullæ; on the states of the consequent sores; upon the character and amount of the constitutional disorder; or of the cachectic taint, or of existing visceral disease when this is present.

10. V. TREATMENT.—The intentions of cure are *first* to improve the state of constitutional power, by suitable diet, regimen and medicines; and *next* to improve the state of the ulcerated parts.—(*a.*) The various remote causes should be removed; and the excreting functions of the skin and the assimilating actions promoted by means of warm, or warm salt-water, or alkaline baths; by a generous, nutritious and digestible diet; by a fresh, dry air; by tonic decoctions or infusions, as those of cinchona, cascarilla, gentian, absinthium, &c., with alkalies, or with the nitro-muriatic acids; and by the preparations of iron, when indications of anæmia are observed. But, whilst these objects are pursued, the alvine secretions and excretions ought to be promoted by stomachic aperients; or by a combination of mild purgatives with tonics, or vegetable bitters, or other restoratives. If these means should fail, a course of the cod-liver oil should be prescribed, as I have lately found it successful in two obstinate cases. When this eruption appears in children, the health, and state of the milk, of the nurse require attention. A healthy nurse should be selected for the child, and change of air recommended if this may be accomplished. When rupia occurs during or after weaning, a nutritious and wholesome diet should be prescribed, and asses' milk, diluted, or fresh whey allowed for drink; but change of air, especially to a dry and open situation, or to the sea-coast, ought to be most strenuously insisted upon.

11. (*b.*) The local treatment of rupia consists chiefly of puncturing the bullæ early, and allowing the morbid secretion to escape, and of having recourse to such applications as will exclude the air and restore the healthy action and tone of the vessels of the part. When the scab is formed over the sore, with the natural intention of protecting diseased surface from the action of the air, then the morbid secretion thereby confined underneath or around the scab perpetuates the irritation, and the healing process is prevented. Hence the necessity of having recourse to such applications as will at the same time exclude the air and restore the healthy state of the parts. The water dressing, by excluding the air, is beneficial, as well as by allowing the immediate escape of the irritating secretion from the surface of the sore; but it does not restore the tone of the affected vessels. Strappings, isinglass plasters, and similar means, do not allow the escape of the irritating secretion, and hence, if not often renewed, they fail of being of service. But when frequently renewed, after the parts are stimulated by suitable application, they are then very beneficial. Lotions containing the nitrate of silver, or nitric acid, or the bichloride of mercury, or tincture of iodine, or the sulphate of zinc, or alum; or sponging the surface with spirits of turpentine; or ointments containing either of the balsams, especially the balsam of Peru, or one of the turpentines, are generally of service. BIETT recommends an ointment containing the proto-ioduret of mercury (ʒj to an ounce), or deuto-ioduret (gs. xii. to ʒj). RAYER, advises the surface of the ulcers to be dusted with cream of tartar. A cretaceous powder, containing the oxide of zinc, is preferable to this. An ointment consisting of one-third or a half-part of the unguent. hydrarg. oxido-nitricum is often of service.

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SALIVATION. — See *Mercurial Salivation, and other forms of Salivation* in art. POISONS, § 580. *et seq.*

SCABIES. — See ITCH.

SCARLATINA RHEUMATICA. — SYNON. — *Febris Exanthematica articularis; Exanthesis Arthrosia; Plantaria; Dengua; Demga; Febris peculiaris epidemica;* — *Giraffe, Bouquet*, Fr.; — *Dandy;* — *Eruptive articular fever; Epidemic eruptive rheumatism*, Cock; — *Epidemic unamolous disease*, Stedman; — *Peculiar epidemic fever.*

CLASSIF. — III. CLASS. III. ORDER. (*Author*).

1. DEFIN. — *Severe pain commencing suddenly in the small joints, followed by local swellings and chilliness, or shiverings; to these succeed heat of skin, intense pain in the head and eye-balls, which soon become general; and on the third or fourth day a scarlet efflorescence appears on the palms of the hands, spreads rapidly over the body, and continues two or three days, after which the symptoms subside; the malady being infectious and epidemic.*

2. The epidemic fever, which has been variously named, but which may be justly called an *eruptive articular fever*, or *eruptive arthritic fever*, has been somewhat differently described, and probably it has presented modifications with the climate, season, locality, and circumstances in which it appeared, and with the treatment prescribed for it. But wherever it has occurred it has prevailed almost universally, few persons having been exempt from it. It has, in every place, however, presented distinct characters which constitute it a disease *sui generis* — different from others in combining an exanthematous eruption, ushered in by fever, with most severe rheumatic or neuralgic symptoms, — the course of the malady being so divided by intervals or remissions, as often to give rise to the idea of relapses having been a common feature in its progress. The first account of its existence was brought from Rangoon in the East Indies, in May 1824; and it appeared in Calcutta in June. It extended in various directions to the different presidencies. Dr. MOUAT states, that it prevailed not only in Berhampore, but in many other places in the vicinity, in March, April, and May 1825. The secretary of the Medical and Physical Society in Calcutta says, that it was particularly severe in the populous towns of Patna, Benares, Chunarghur, and numerous other places. Dr. MOUAT describes it as "an epidemic fever," which was characterised by "the suddenness of its attack, the redness and watering of the eyes, the acute pain in all the joints, rendered excruciating on the slightest touch, the scarlet or crimson efflorescence on the surface, and its sparing neither age, sex, nor habit of body." The accounts furnished by the East Indian physicians of the symptoms and treatment of this epidemic fever, agree in the essential characters, but are desultory, and very imperfect in many respects, and are mixed up with speculations, as usual, as to the influence of too much rain, or of too little rain, of electrical conditions, of terrestrial emanations, and of other suppositious causes in producing it, whilst the most obvious and true cause is entirely overlooked. The physicians who have written from their experience of the epidemic in the West Indies and North America, two years after the prevalence of it in the East, have given the fullest account of its symptoms and treatment, but without being acquainted with its previous appearance in the East Indies.

3. This disease made its appearance in the Island of St. Thomas, in the West Indies, in September 1827, and soon extended to the rest of these islands and to the southern states of America. It advanced westward among the islands during the winter, and spread to the ports on the Gulf of Mexico. Thence it travelled northwards, and reached New Orleans in the ensuing spring. During the summer Savannah and Charleston were severely visited by it. A few cases of it appeared in Philadelphia and New York; but it did not extend farther north. It has been described by the several writers referred to hereafter, but with much difference in many particulars; and it does not clearly appear whether or no the difference was owing to the influence of climate and locality, or to the treatment adopted by the writers. Dr. STEDMAN, who practised in the Island of St. Thomas, where it first appeared, and Dr. DICKSON of Charleston, have given good descriptions of it. The former states, that of a population of 12,000 in the principal town of St. Thomas, scarcely one escaped. It appeared so suddenly, and spread so rapidly, as to have caused great alarm; but it soon was discovered that although a most painful, it was not a dangerous malady; yet it often left much suffering, and even disease, after the decline of the more severe symptoms.

4. I. DESCRIPTION. — Dr. STEDMAN divides the course of the disease into *three stages*. — (*a.*) In the *first*, the invasion was somewhat different in different cases. Usually a person in perfect health was suddenly affected with stiffness and pain in one finger, commonly the little finger. The stiffness and pain increased and extended up the hand, along the arm to the shoulder. The fingers of both hands became swollen, stiff, and very painful, and incapable of being bent. Sometimes the affection commenced in the lower extremities, always in the small joints, and extending to the large, and to the trunk. These symptoms were followed in a short time by restlessness, depression of spirits, by nausea, in some cases by vomiting, and by chilliness or shivering. But Dr. DICKSON states, that shivering was either slight or wanting in the disease, as it prevailed in Charleston. To these succeeded fever, with great heat of skin, intense headach, acute pain in the back, knees, ankles, and in every joint, with violent pain in the eyeballs, which felt to the patient as too large for their sockets. In some cases, whilst the extremities were cold at first, the rest of the body was intensely hot. As the fever and heat of skin were developed, the whole body, particularly the head, eyes, back, and joints were racked with pain. In some, the features were swollen and distorted, especially the eye-lids; in others, with swelling of the face and distortion of the fingers, soreness of the mouth or ptyalism occurred. Patients often complained in this stage, as well as in those which followed, of a feeling of great cold, even when the skin was very hot to the touch. When Dr.

STEDMAN had the disease, he covered himself with three blankets, although the weather was sultry at the time. The severe pains, restlessness, and nausea, rendered this stage the most distressing of any form of fever, excepting rheumatic fever. These symptoms generally continued with more or less severity for twenty-four or thirty-six hours. The fever then abated, and with it also the pains. The patient, however, continued in a state of languor, irritability, and restlessness for three days, but without fever; and generally without hunger, thirst, and altogether without taste, the tongue being loaded, and the mouth presenting small aphthous sores. The pulse was in this stage much accelerated, the urine high-coloured, and the bowels confined.

5. (*b.*) The *second* or *eruptive stage* commenced the third or fourth day after the primary fever, generally the third, with a return of fever; and with an efflorescence which appeared on the hands and feet, and rapidly spread over the body. This eruption is differently described, both as to its characters and time of appearance; and probably it was modified in different cases; but in this, as in other respects, the descriptions are loose, devoid of scientific precision, and by no means creditable to the writers. Dr. STEDMAN describes the eruption as that of "a *blotch* or *wheal* of red-coloured skin, between that of scarlet fever and that of measles." Others state the eruption to resemble that of scarlet fever; others that of measles, some that of roseola or erythema, and some the nettle-rash. It was attended, "in the severer cases, by swelling of the feet, hands and face, particularly the eyelids, and by a distressing tingling, which, as the eruption disappeared, became an intense itching. The efflorescence generally began to fade on the second day, and was entirely gone before the third morning of its existence. This was followed in almost every case by some degree of desquamation," which, in a few instances, gave rise to troublesome consequences. After this eruptive stage, many patients began to recover their spirits and strength, a complete want of taste often remaining for some days; but many patients also became subject to the next stage.

6. (*c.*) The *third*, or *rheumatic stage*, sometimes immediately followed the eruptive stage, but often not until one, two, three or four weeks, or more had elapsed; and however early or late it appeared, it was generally of considerable duration, the pains and paralysis being greater than at first. "These pains were not accompanied with fever; and they generally fixed themselves in one or two joints, and continued to excruciate the patient for weeks." They were always severest in the morning, and wore off in some degree towards evening. Some were tormented in addition by most distressing itching of the skin; and in others the joints, particularly those of the fingers, were painful, stiff, and swollen, so as to produce deformity. The secondary pains were chiefly in the fingers, toes, wrists, ankles, and knees; confined persons to their beds, and were so aggravated on motion as to call forth groans and shrieks from those who suffered this stage severely. Except these pains, and the irritation they occasioned, "no other symptom of disease remained. The appetite was good, although the sense of taste was blunted." — "In a period varying from three to four, or six days, the pains began gradually to subside, deserting one joint after another until they remained fixed for some time in one. This process occupied several weeks, and was often attended by relapses." This description, however, applies only to the severest form of the malady; endless grades of severity, as well as differences in the stages having been observed; "for while some, who underwent the primary fever with the utmost mildness, had the eruptive attack with great violence; others who had passed gently through both, and were congratulating themselves on their escape, were suddenly crippled by the secondary pains." It was remarked, that those whose unavoidable occupations forced them to exertion, or who had resolution enough to exert themselves, got sooner rid of the pains than those who gave way to them.

7. (*d.*) The *differences* or *modifications* mentioned by those who have described the disease were numerous. Dr. STEDMAN remarks that the negroes were much less severely attacked than the white inhabitants; and yet the only three fatal cases which occurred in the island were negroes. Dr. DICKSON, of Charleston, states that excessive determination of blood to the head was frequent, and that delirium was present in several instances; but that it went off with the fever of the first stage, which did not remit, but subsided in a short time — on an average, in about thirty-six hours. The skin at this stage was at first hot and dry; but an abundant perspiration was thrown out, attended occasionally by a rash or miliary eruption. This eruption appearing in the first stage (not the characteristic eruption) was very various, and not the regular or true one. Children were often thus affected by it, and in several adults a thick crop of pimples was the first token of disorder. On the third or fourth day, little or no fever being present, the tongue became coated with a yellowish fur; the stomach uneasy or distressed; the patient low-spirited, impatient, fretful and restless at night. Frequently there were great lassitude and debility, nausea, vomiting, and a distressing feeling of oppression. About the sixth day of the disease "these symptoms were more or less relieved by the coming out of an abundant eruption, which must be regarded as an essential or characteristic part of the malady. It consisted of irregularly shaped patches, red and elevated; the feet and hands swelling with thickening and numbness. There were much itching and burning of the skin, and at this period a second febrile paroxysm often came on; and the pains of the joints were in many aggravated to their former severity." In some cases, the first stage of the disease had passed over with very little notice or complaint, and yet in them this eruptive or second stage was very violent. "Many became sensible on the third or fourth day of an inflammation and enlargement of the glands in the groin, axilla, neck, &c. and these glands continued swollen and painful a long time after convalescence was established."

8. Very young *children* were liable to the disease, even from a few days after birth: some were supposed to be born with it. In these the skin was of a scarlet red, and the tongue and lips smooth and fiery The infant could not bear to be disturbed; it screamed violently when lifted or when any of its limbs were moved. Below fi years of age convulsions very commonly attend

the invasion, and sometimes continued with great frequency throughout the whole of the attack. *Pregnant women* were very liable to abortion, instances of miscarriage having been numerous. They were usually seized at the very commencement with violent pains in the back and loins, extending into the thighs, occasioning the expulsion of the fœtus. In old persons, the disease occasioned excessive prostration of strength; and in several of these, it left behind it an erysipelatous inflammation of one or both legs. There was often soreness of the mouth; looseness, lividness, and sponginess of the gums, with slight salivation. Ulcers sometimes formed in the mouth, which were occasionally painful, irritable, and difficult to heal. Very few died in Charleston; but the aged, the intemperate and corpulent were severely shaken by the malady, and remained long debilitated and emaciated; few persons above the age of sixty had absolutely recovered from it after two or three months from the attack.

9. II. CAUSES.—Nearly all who observed this epidemic in the western hemisphere have considered it infectious. Drs. STEDMAN and DICKSON, who have given the fullest account of it, concur in this opinion. The introduction of the disease from one island to another, and the propagation of it from persons and places to others, were so frequently and so incontrovertibly proved, that no doubt as to the fact of its infectious nature was entertained. But how did it originate? for there was nothing in the medical topography, the season, the weather, or the climate of St. Thomas, where it first appeared, in the West Indies, to account for the occurrence. Dr. STEDMAN states, in his very disjointed, although tolerably full account of the epidemic, that it was supposed to have been brought to the island by a vessel from the coast of Africa; but that this fact was not satisfactorily ascertained. Nor, indeed, does it appear, that any trouble was taken to determine the matter. Dr. DICKSON states that the disease was imported into Charleston by the captain of a ship who brought it from the Havanna and communicated it to his family; and that the transmission of the disease was traced from one subject to another. Dr. D. considered it a contagious eruptive fever; and remarked, that, in a few cases, in which the eruption in the second stage did not take place, the patient was liable to a second, third, and an indefinite number of returns of the disease, whilst those "*who were properly covered with the eruption about the sixth day were protected from any future attack.*" He states this to have been a rule to which there was no exception in his practice, and that this protection had particularly attracted his attention.

10. III. NATURE.—The descriptions which have been given of this disease show it to have been an infectious eruptive fever, *sui generis*, attended by severe arthritic, or rheumatic, or neuralgic pains, to which all were predisposed who were not protected by a previous attack. In this it agreed with scarlet fever, measles, small-pox, &c.; and with these diseases it also agreed in its specific eruption appearing at a definite stage of its progress. The eruption itself has not been described with precision; but it appeared to have more closely resembled that of scarlet fever than any other, or to have been intermediate between it and measles. It appeared to have consisted of large scarlet blotches, which were smooth and slightly elevated, owing to the congestion of the minute sub-cuticular vessels, and which terminated in desquamation. The violent articular pains, swelling, and stiffness were evidently results of a remarkable alteration of the organic sensibility, with a consequent change of the capillary circulation in the synovial and other tissues of the joints, as well as in the vascular rete of the skin. Whilst the cutaneous eruption, occurring at a certain period, and continuing only a short time, entitles the disease to rank amongst the exanthemata, the painful state of the joints imparts to it the rheumatic character. That it was not a form of scarlet fever is shown by the severity of the rheumatic or neuralgic symptoms; by its having attacked persons who had previously had scarlet fever; by the absence of the nephritic disease and dropsy so often consequent upon scarlet fever, as well as of the internal affection so frequently complicating this fever. That it was not a rheumatic fever was shown by the undoubted propagation of it by infection, by the character and time of the appearance of the eruption, by the course of the disease, by the absence of any cardiac or other internal complication, and by the protection which a full evolution of the eruption afforded from a second attack. Dr. DICKSON doubts that this was a new disease, and believes it to have resembled a form of remittent fever observed and described by Dr. RUSH in 1780; but the differences between them are too remarkable to admit of any resemblance, and he was unacquainted with the accounts of the prevalence of the epidemic in the East, contained in the Transactions of the Medical and Physical Society of Calcutta. According to these accounts, as well as to those given of it in America, the disease appears to have possessed an asthenic character; as those who were bled, especially in large quantity, were long in recovery, although a moderate bleeding was beneficial in the plethoric or those lately arrived from Europe; and it seemed to have pursued the usual course, particularly as respected the first and second stages, whatever means were used—to have been incapable, like the other exanthemata, of being cut short by any treatment, however much its violence was mitigated—a mitigation which was best accomplished by an emetic, followed by mild purgatives and diaphoretics. The very few deaths which occurred during this epidemic appeared to have arisen either from pre-existent organic lesion, or from some coincident or intercurrent disease produced by its usual causes, and presenting no necessary connection with this malady.

11. IV. TREATMENT. — Dr. STEDMAN states that the first cases which appeared at St. Thomas were so mild that he prescribed only purgatives, the warm bath, pediluvium and diaphoretics. When the pains were severe patients refused purgatives, owing to the distress occasioned by the least motion. As the cases became more severe in the course of the epidemic he had recourse to bloodletting, during the establishment of the febrile excitement of the first stage taking away from 12 to 20 ounces, but never more, nor ever repeating the operation. After bleeding and purging he gave Dover's powder at bed-time. During the eruption he gave cooling aperients and cooling beverages, and prescribed the usual washes for the

soreness of the mouth. Dr. Cock adopted a similar plan of treatment to that of Dr. Stedman. Dr. Dickson states, that he, as well as others, at first prescribed bleeding, purgatives, and warm diaphoretics; but the great severity of the pains induced him to give large doses of opium, and the relief and success following the practice induced him to persist in it and to relinquish bloodletting, as he believed that not only was the vital fluid thus husbanded, but the subsequent sufferings were lessened in severity and duration. He considered that, beyond the preservation of an open state of the bowels, cathartics effected very little benefit; and that an emetic was less objectionable, but was in most instances unnecessary. In addition to a free recourse to opium he employed camphor, æther, and sinapisms externally. Restoratives appeared to have been required at an advanced stage of the disease, especially in aged and delicate persons.

12. In the East Indies, the softness of the pulse and the general depression deterred many medical men from bleeding from a vein; but some had recourse to the application of leeches, and others considered that bleeding in any form was prejudicial. The most successful practice appears to have consisted of the administration of an active emetic, followed by purgatives so as to freely evacuate the bowels; and these by opiates or anodynes with diaphoretics; restoratives and tonics having been given after the subsidence of the eruption of the second stage.

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SCARLET FEVER. — Synon. — *Scarlatina* (from the Italian, *Scarlatto*, scarlet, a deep red), Sauvages, Vogel, Juncker, Cullen, J. P. Frank; — *Morbilli confluentes, M. ignei; Rubeola confluens; Febris purpurata; Rosalia, Rossalia, R. squamosa*, Auct.; — *Morbus scarlatinosus; Febris scarlatinosa; Febris scarlatina*, Sydenham; — *Purpura scarlatina*, Burserius; — *Gutteris morbus epidemicus Foresti; Febris rubra*, Heberden; — *Typhus scarlatinus*, Crichton; — *Typhus scarlatina*, Young; — *Exanthesis rosalia*, Good; — *Febris scarlatino-miliaris anginosa; Porphyrismus*; — *Porphyrisma*, Ploucquet; — *Fièvre rouge, F. pourprée*, Fr.; — *Scharlach, Scharlachfieber, Scharlachkrankheit, Scharlachaufschlag*, Germ.; — *Scarlattina*, Ital.; — *Scarlet fever, Rash fever.*

Classif. — 1st Class, Febrile Diseases; — 3d *Order*, Eruptive Fevers (*Cullen*): — 3d Class, Diseases of the sanguineous Function; — 3d *Order*, Eruptive Fevers (Good).—III. Class. III. Order (*Author in Preface*).

1. Defin. — *An infectious continued fever; on the second day of which, or sometimes later, a scarlet efflorescence generally appears on the fauces and pharynx, and on the face and neck, spreads over the body, and commonly terminates in desquamation from the fifth to the seventh day; the fever being accompanied with affection of the kidneys, often with severe disease of the throat, or of some internal organ, and sometimes followed by dropsy, and occurring only once during life.*

2. There is reason to doubt that the Greeks and Romans were acquainted with this disease, and the doubt applies equally to the Arabians, although a few passages in Rhazes might support the idea that scarlatina was confounded by the Arabian writers with measles. The first writer who distinguished the disease is stated by Hildenbrand and J. Frank to have been Ingrassias, who remarks that before the period at which he wrote it was called *Rossalia* or *Rossania*, from *rosso*, red; and that, although it was generally considered as the same malady as measles, yet he was convinced, by his own observations, that the one was different from the other. J. Coyttar, a physician of Poitiers, published an account of an epidemic which prevailed in 1557, having the characters of this malady; and Forestus states, that the epidemic at Amsterdam in 1517, described by Tyengius, was this malady. According to Wierius and Schenk, this fever appears to have been prevalent in Lower Germany in 1564 and 1565; and Ballonius states that it was epidemic in Paris in 1581. De Heredia describes it by the appellation of "*Angina maligna.*" The disease which was epidemic in Naples in 1620, and of which accounts were published by Carnevala, Nola, and Sgambarti, was probably scarlatina anginosa, which was then variously denominated, but most frequently as "epidemic phlegmonous angina," "a pestilential affection of the fauces," &c., although Hildenbrand entertains a different opinion. From this period accounts of several epidemics of scarlatina were furnished by writers, the symptoms and characters of which appear to have varied then as in more recent times. D. Sennert was the first to give a true description of scarlatina, in 1619. Subsequently Winkler, in 1642, Welsch of Leipsic, and Schulze in Poland, observed severe epidemics of this malady, and described it by the name of "malignant purpura," by which it was then known. The epidemic described by Sydenham, from 1667–73, appears to have been comparatively mild; whilst that observed by Morton, from 1672 to 1686, seems to have been much more severe; but he has noticed it as differing from measles, chiefly as respects the character of the eruption. During the eighteenth century this malady became more and more frequent, and the general prevalence and the great fatality of its epidemic visitations roused medical attention to its nature and treatment. Storch, Huxham, Stoerk, Fothergill, Heberden, De Haen, Bicker, Blackburne, Grant, Sachse,

KREYSIG, WITHERING, REUSS, and many others, have described these visitations. During the early part and middle of that century, scarlet fever was variously named, and not only distinguished from other diseases attended by efflorescence, but more especially from measles and roseola. The writings of HEBERDEN and FOTHERGILL in this country were the first to show the distinct nature of this malady; and those of WITHERING placed this fact beyond dispute. At the present day scarlet fever is never absent, either in a sporadic or epidemic form, from any country in Europe, although in different degrees of severity and of prevalence. In warmer countries it appears chiefly as an epidemic, and generally after considerable intervals of immunity from its devastation.

3. I. DESCRIPTION OF REGULAR OR NORMAL SCARLATINA. — The *course* of scarlatina has been divided into *three periods*, or stages, by some writers, and into *four* by others; these latter dividing the second stage into two. 1st, That of invasion, or that preceding the eruption; — 2d, That of the eruption (comprising the periods of eruption and of efflorescence); — and, 3d, The stage of desquamation. When scarlet fever proceeds in its more regular or usual course, these periods are generally very distinct; but when it assumes certain varieties, forms, or complications hereafter to be noticed, they are often indistinct, or even not altogether observed.

4. *A.* The *first stage* of *regular or normal scarlatina — stadium invasionis, s. irritationis* — is attended by general uneasiness, lassitude, headach, or giddiness; by a sense of depression, and loss of strength. The patient dislikes food, nauseates animal food, and complains of chills, horripilations, shiverings, or rigors. These are succeeded by heat of skin; great acceleration of pulse; by urgent thirst; by increased headach; by pain and redness in the throat, with difficulty of swallowing. The eyes are often red, and intolerant of light. These symptoms are the most constantly observed; but in severer cases nausea, vomiting, violent pain in the head, with aching of the back and limbs; augmented sensibility, sleeplessness, occasionally delirium, or even convulsions, in very young subjects, are also observed. Fever is always present, although often slight; and either exists alone, or precedes or accompanies the angina. It is often severe, the pulse being very rapid and full, the skin dry and burning, and the face congested, tumid, or slightly suffused. The redness of the fauces and pharynx is frequently great on the first day, sometimes in the course of a few hours, and the tonsils are swollen. The redness and congestion sometimes extends to the posterior nares, causing a stuffing sensation in the nostrils, and occasionally there is hoarseness. The tongue is covered at its base with a whitish or yellowish coating, is red at its edges and point, and its papillæ are erect or excited. The bowels are costive, or irregular; and the urine is scanty, high-coloured, voided frequently, and is sometimes albuminous, or soon afterwards presents these characters. In most cases these precursory symptoms continue but one day; in others they are prolonged, the eruption not appearing until the third or even the fourth day: in some the febrile symptoms are either so slight as not to attract attention, or are so instantaneous and brief as to appear as if merely ushering in the angina or efflorescence. The perspiration possesses a peculiar odour, which has been variously described by HEIM and others.

5. *B.* The *second stage* commences with the eruption, which appears generally about the second day, — sometimes on the evening or night of the first day, and occasionally not until the third, or even fourth day. The efflorescence appears first on the neck and face, especially the cheeks, the tint of which is commonly deeper than that of other parts of the countenance. Sometimes the chest or trunk, or the extremities, or even the hands and feet, first exhibit the eruption, which extends more or less over the body. The eruption consists of an infinite number of minute red points, which appear in a rose-coloured ground, and are not visibly or sensibly elevated. These points, which are finer, redder, more regular, and more confluent than those of measles, are transformed into patches, which are not elevated, and appear smooth or continuous with the surrounding surface. The patches, at first distinct, enlarge, and thus coalesce; ultimately imparting a scarlet tint to the skin, which disappears momentarily from the pressure of the finger. The skin is now very hot, dry, and somewhat rough to the touch. It is sometimes diffusely tumefied, from the cutaneous and sub-cutaneous congestion, especially in the neck, face, feet, hands, and flexures of the joints; and is often the seat of a disagreeable stinging or pruritus.

6. The redness of the fauces and pharynx, and the swelling of the tonsils and adjoining glands, are now considerable, often occasioning occlusion of the throat, and, externally, more or less tumefaction. The swollen tonsils are covered by a thin, soft, and whitish exudation of lymph. The tongue sometimes retains its coating, but as frequently it is gradually deprived of it from the edges to the middle, and it then presents a deep red hue, and appears so smooth as if varnished: occasionally the elevation of the papillæ gives it a strawberry appearance. About the third or fourth day the eruption has reached its height. It is usually most vivid about the groins, the insides of the thighs and lower parts of the abdomen, and on the inner flexures of the joints; and it continues the longest in these situations. It is redder during any excitement, or when the child cries; and is paler in the morning, and deeper in the evening and night, when the fever is highest. The redness of the skin, at its greatest pitch, has been likened by P. FRANK and others to that of a boiled lobster, and by others to scarlet cloth. It is the most continuous, general, and deep in the most severe cases, and when the febrile symptoms are the most acute. The skin is remarkably hot, varying from 104° to 108° of Farenheit's scale; but not so hot as reckoned by CURRIE.

7. During the eruption, the countenance expresses anxiety and suffering when the disease is thus severe. The eyes are animated and brilliant; delirium and restlessness often occur at night; and a sleeplessness, which resists the usual means of procuring rest, is caused by the heat and stinging of the surface, and the affection of the throat. This affection is sometimes so severe, the swelling of the subjacent cellular tissue, and the exudation of soft lymph from the inflamed surface of the tonsils, fauces, and pharynx so considerable, and the secretion from the salivary glands so viscid

and scanty, as to materially increase the distress of the patient. Thirst is now urgent; respiration is accelerated, somewhat difficult and laboured, and the breath is hot. The pulse is very rapid, full, broad, and compressible. In some cases slight sopor is observed; in others a sense of sinking is felt. The bowels are generally costive; but a slight diarrhœa occasionally supervenes, with colicky pains. The urine is scanty, frequently voided, and high-coloured, sometimes albuminous. The patient exhales the peculiar odour already noticed, which is difficult to be described, although readily recognised by the experienced observer. After five, six, or eight days' duration—generally after a longer period than in measles—the efflorescence fades; at first assuming a violent tint, and afterwards a pale rose or coppery hue. Generally the mucous membrane of the mouth and throat continues still red; and often it is not until now that the tongue is deprived of its coating, and shows its characteristic redness and prominent papillæ. The swelling about the neck and throat now diminishes, and the next stage supervenes.

8. *C.* The *third stage*, or that of *desquamation*, commences at various periods, in the different forms and complications of the disease; and even in the more regular type it varies remarkably as to the time of its occurrence. If the fever and eruption are slight, desquamation may follow the fourth or fifth day. If both the fever and the eruption are intense, it generally is not observed until after the seventh day, or not until the eighth or ninth. With the subsidence of the fever and of the redness of the surface, the furfuraceous desquamation commences. Occasionally this change is ushered in by a slight perturbation or exacerbation of the various febrile symptoms, followed by slight diarrhœa, or by epistaxis, or by the catamenia in adult females, or by a copious discharge of turbid urine, depositing a whitish or rose-coloured sediment; or by a free perspiration, having a strong and peculiar odour. The affection of the throat in this regular type of the malady becomes less severe; although, in some cases, it is not ameliorated until a later period; and the external swelling continues somewhat longer, the internal exudations still remaining, or proceeding for a short time. The pulse evinces less irritative excitement; is less full, less quick, but still accelerated, and soft or weak. The tongue is clean, but red and flabby; and it does not regain its natural hue until after the guttural affection is removed. As desquamation proceeds, the surface becomes paler; the epidermis exfoliating in small furfuraceous whitish scales on the trunk of the body, and in large scales or lamellæ where the epidermis is thicker, as in the extremities, and in the hands and feet. With the desquamation the function of cutaneous transpiration is gradually restored, and convalescence commences. But the pulse often continues accelerated or weak, or very compressible; the urine sometimes albuminous, or the bowels disordered; and convalescence becomes interrupted, delayed, or entirely arrested by some serious consecutive affection hereafter to be mentioned, and which should be anticipated and guarded against. In some instances, the desquamation does not occur for several days after the redness of the skin has disappeared, or not until a fortnight or three weeks have elapsed; but it usually follows the same order as that observed by the progress of the eruption.

9. II. Of the Types and Irregular Forms and Complications of Scarlet Fever.—The *types, forms*, or *varieties of scarlatina* vary remarkably, not only in individual sporadic cases, but even in different persons of the same family in the same epidemic. The forms are remarkably modified as respects—1st, The characters and duration of the eruption;—2d, The type or character of the constitutional affection—the nature of the fever;—3d, The seat and nature of the complication;—and, 4th, The nature and prevalence of the sequelæ, reliquiæ, or consecutive diseases. The irregularities, or anomalous forms (as they have been usually termed) of this malady require a much more serious attention than the more regular states; for these latter are not more frequently met with than the former, and are seldom attended with danger, unless they are neglected or mismanaged; whilst the former are for many years the most prevalent forms of the disease, and are much more frequently attended by danger—sometimes the most imminent danger—as regards either their invasion and progress, or their sequelæ. Like measles, but still more remarkably than that malady, scarlet fever presents the utmost diversity of form, severity and complication—a diversity depending upon epidemic constitution, upon local or endemic causes, upon the accumulation of morbific exhalations, and upon undue crowding and the absence of sufficient ventilation.

10. Of these several circumstances tending to modify the nature and form, or to extend or limit the prevalence, or to complicate the character of scarlet fever, there is none more influential than the prevailing *epidemic constitution*—the "*Constitutio morborum stationaria*," first insisted upon by Sydenham, and recently by Autenreith, and by one of our best and most practical writers, Dr. Graves. There is no kind of fever which displays a greater diversity in its nature and complications, according to the prevailing epidemic constitution, than scarlet fever, or which manifests the character of such constitution more remarkably than it. Upon whatever cause this stationary epidemic constitution may depend—whether or not it may be connected with the long prevalence of dry, or of wet, or of cold, or of hot seasons, either of which has been observed to occur for several years in succession, giving rise accordingly to either inflammatory, or adynamic, or gastric, or other forms of the malady,—or whether or not it may be aided by prevailing states of the electricities influenced by these conditions of the seasons,—there can be no doubt of its influence,—an influence which has been duly recognised by those whose experience has been of sufficient duration to have observed the changes of those epidemic constitutions, or whose learning has made them acquainted with the experience of other observers. The *forms* and *complications* of the disease, therefore, which will require an especial notice at this place, are, 1st, those which respect more particularly the appearances of the eruption;—2d, those which consist chiefly of the state of vascular action and vital power;—and 3d, those predominant affections which arise either in the course of the disease, or as a consequence or consequela of it.

11. i. The Appearances of the Eruption or

efflorescence are always deserving of attention, for the purpose not only of diagnosis, but also of furnishing indication of the state of vital power.— *A.* The eruption may be *partial;* in this case it is observed chiefly in the neck or chest, or on the trunk, or on the flexures of the joints, or on other parts, in the form of red patches, of variable extension. Sometimes the redness is excessive, deep, and extensive, or general; at other times it is slight or pale. Frequently redness is uniform throughout. Occasionally a number of small violet-coloured points are dispersed through the reddened ground; these points differing, however, from the punctuated form of eruption. In some cases a miliary eruption — or miliary vesicles — the *scarlatina miliformis* of P. Frank — more or less abundant, appear at the commencement, more frequently than at the decline of the efflorescence, and are found most frequently on the neck and chest, and on the insides of the thighs and arms. These vesicles are sometimes interspersed with sudamina, or with papulæ, but very rarely with true pustules. Owing to the existence of these secondary or intercurrent eruptions, scarlatina has been termed *miliformis*, or *papulosa*, or *phlyctenosa*. These irregularities are not indications of any departure from the usual course of the disease, nor of an unfavourable result.

12. Reuss, Raimann, and Hildenbrand have observed, in rare instances, the eruption on the second day of the efflorescence, of *bullæ* of a dark red colour, above the size of a nut, containing a yellowish serum, and resembling that produced by a blistering plaster. The cuticle breaks, and, the fluid being discharged, a sore remains, which follows the course of the constitutional malady — *scarlatina pemphigodes*, Hildenbrand. The few cases in which this state of eruption has been observed, have been characterised by a remarkable degree of heat of skin, with a disposition to a septic or putrid condition. The only instance in which I observed this appearance of the eruption was that of a man of middle age, referred to hereafter, who accidentally allowed the discharge from the throat of his child shortly before death from malignant scarlatina, to remain on parts with which it had come in contact for some time. In the more malignant or dangerous states of this fever, the eruption assumes a deep, or dark, or livid appearance, or an almost violet tint; the darkness of the hue being great generally in proportion to the malignancy or putro-adynamia characterising the malady — to the depression of vital power, and to the change in the blood. In some of these cases, petechiæ or ecchymoses are found more or less abundantly interspersed in the deep red, or livid surface. In rarer instances the skin exhibits, in patches, altered dark blood effused between its layers — *Scarlatinal purpura.* This hæmorrhagic tendency, arising from extreme deficiency of vital power in connection with a poisoned or altered state of the blood, in which the fibrine has lost its power of vital cohesion, is remarkable in some epidemics, especially in those of a malignant or putro-adynamic character.

13. *B.* Besides irregularities in the form and appearances, the eruption may be abnormal in its *course* and *duration.* It may be long in appearing, the fever continuing three, four, or five days before any eruption breaks out. This not infrequently occurs in the more dangerous and complicated cases. On other occasions the eruption is remarkably early, especially in very favourable cases, when it sometimes almost immediately follows the fever, the symptoms of which may be so slight as to escape detection, or may be masked by some antecedent or existing affection. The efflorescence, having made its distinct or early appearance, may either disappear prematurely or suddenly, or it may continue an unusually long time. The *retrocession* of the eruption may be occasioned by cold or by an internal complication, or intercurrent affection. Occasionally the eruption disappears on the first or second day, and reappears again, after two, three, or more days. In rare cases, I have observed it continue nearly its usual time, and reappear after seven or eight days, and then proceed the usual course. In other cases, the efflorescence comes out freely, then fades, and soon afterwards is again abundant, thus assuming a remittent form, the remissions appearing chiefly on alternate days, the eruption being most abundant when the febrile action is highest. The eruption may, moreover, be of unusually long duration — may be prolonged to the ninth or tenth day. This is most apt to occur when it is general and intense; the persistence being longest in the extremities.

14. *C.* The *absence of eruption* in true scarlet fever has been doubted; but has been admitted by Huxham, Fothergill, Aaskow, Stoll, Bang, Ranoë, Rumsey, Dance, Guersant, Trousseau, Berton, and others. The circumstance of individuals having the constitutional affection, either with or without sore-throat, during the epidemic prevalence of the disease, and the existence of it amongst the other members of the same family, in its more usual forms, are proofs of this affection being actually scarlet fever, although unaccompanied with eruption; and the propagation of the malady from cases of non-eruptive scarlatina, further confirms this opinion. Some epidemics are remarkable for the number of cases in which the eruption is not observed, the disease being characterised by the other usual symptoms, especially by the sore throat, by the appearances of the mouth and tongue, occasionally by the desquamation of the cuticle, especially in adults; and by consecutive dropsy, these cases communicating the eruptive disease. Sometimes, however, the eruption appears in so slight, partial, or evanescent a form as to escape observation. In these cases, the state of the mouth, fauces, and throat, and the constitutional affection, are the chief proofs of the presence of this malady, especially when viewed in connection with the prevalence of it in the vicinity, or in the same house or family. It should not, however, be overlooked, that sore-throat with fever, both the local and constitutional affections being characterised by remarkable asthenia, amounting even to putro-adynamia, may occur sporadically or endemically, or even epidemically, independently of any connection with scarlatina, and amongst persons and families who have already been the subjects of scarlatina. Of these occurrences I have met with several instances, the greater part of a family, all of which had previously had scarlet fever, having been thus attacked. (See art. Throat.)

15. But a child in the same house or family in which scarlet fever is unequivocally present, may have the constitutional affection, not only without

the characteristic eruption, but even without the sore-throat also; both these essential features of the malady being either entirely wanting, or so slight, or so evanescent as to escape detection. Is the fever which is alone present—without the usual local affection—truly scarlet fever in these cases; and is it, admitting the affirmative, capable of propagating the true and characteristic form of that disease?—That the fever—the constitutional affection—is scarlet fever, notwithstanding the absence of the eruption and of the sore-throat, I believe for the following reasons, namely—1st, its occurrence in individual members of a family, the rest of which are about or near the same time the subjects of scarlatina;—2d, its occasional complication with the internal affections, sometimes complicating scarlatina;—and 3d, the very frequent appearance, in these cases, of renal affection, of albuminous urine and consecutive dropsy or inflammation. This form of the disease may be justly called *latent scarlet fever.*

16. ii. The Forms of Scarlet Fever depending upon the States of Vital Power and Vascular Action.—*Upon the type or character of the constitutional affection.*—It is of the utmost importance to estimate, with tolerable accuracy, the states of constitutional disturbance existing in individual cases, and constituting in the aggregate of cases the prevailing epidemic character. In no disease is more discrimination requisite than in this, in determining both its type or diathesis, and the nature of its existing complications; and, as to none besides has more misconception existed, or has more false and mischievous doctrines been promulgated. "The blind have too often attempted to lead the blind;" and the credulous and docile many have submitted to the guidance of those who formed and promulgated their opinions from insufficient experience, or from an acquaintance with a single epidemic only, and who, estimating with as little modesty as accuracy their own opinions, denounced or ridiculed the greater experience and the juster views of their enlightened predecessors and contemporaries.

17. The *constitutional character* of scarlet fever is dependent upon several circumstances which are fully stated hereafter; and which combine to produce the pathological condition observed even in sporadic and mild, although most remarkably in extensive and fatal prevalences of the malady. The states of season, weather, and stationary and prevailing epidemic constitutions; animal exhalations, putrid effluvia, and every form of malaria, especially when aided by warmth, humidity, and imperfect ventilation; and crowded, low, or close habitations, are the chief causes of the several dangerous constitutional forms and complications which the disease assumes—causes, however, existing in intimate connection with the concentration or dose of the poisonous emanation—of the specific animal poison, and with the states of vital power, or resistance of the infected. The combinations, conditions, and operations of these causes, are especially concerned in the epidemic occurrences of the more malignant types or states of the disease which are to be particularised in the sequel.

18. *A.* Scarlatina mitis.—*S. simplex.*—*Mild or simple scarlet fever* may prevail either in a particular district, or season, or still more extensively, and for several seasons. It may even be the most general form of an epidemic during successive seasons. It is met with in all circumstances, and seasons, and even in some of the members of the same family, in which malignant and complicated cases exist; and in the regular form above described; the disease being characterised chiefly by the mild or moderate degree of fever; by the efflorescence which generally appears early, or on the second and third day, and disappears with desquamation of the cuticle, from the fifth to the seventh; and by the slight affection of the mouth and throat, which, in many cases, is but little complained of, although, on inspection, the edges of the tongue, the fauces, pharynx, and Schneiderian membrane and internal surface of the eyelids present more or less redness. However mild the constitutional affection, or slight the affection of the throat, and however free from internal complication the complaint may be during its course, nevertheless the sequela may be serious, but chiefly as respects the disorder of the kidneys and the consecutive dropsy. Indeed, when very slight or mild attacks occur during the more severe or malignant prevalences of the malady, then these mild cases are the most apt to be followed by dropsy, unless the treatment during convalescence be most judicious, and even although the requisite care be taken.

19. *B.* Scarlatina anginosa.—*S. inflammatoria,* Hildenbrand and Naumann.—This variety presents every phase from the mild to the malignant, and the most varied and serious complications. In this the fever is generally severe or intense, even before the eruption appears, and is ushered in by rigors, stiffness, and soreness of the throat, by intense redness of the fauces and pharynx, and painful deglutition. The tonsils are swollen, and a viscid secretion from the salivary glands, and mucous follicles, adhere to the inflamed surface, with patches of lymph of a greyish or whitish-grey hue, which cover the tonsils and pharynx, and often also the fauces, but very rarely the larynx. The papillæ of the tongue are enlarged and rise through the whitish or yellowish-white fur or mucus. The eruption is generally delayed to the third or fourth day; but it occasionally appears earlier, or even as early as the first day; then subsides prematurely, and not returns; or it re-appears in various grades; or continues with great and general intensity even beyond the usual period. These irregularities of the eruption depend much upon the nature and severity of the internal complication when this exists, and upon the violence of the fever, which is often greatest on the second or third day. The heat of the skin is then very remarkable, varying generally from 104 to 108. Thirst is urgent; the pulse is very much accelerated, full, and strong, but not hard or constricted. The affection of the throat is now severe, and the swelling so great as to impede or even prevent deglutition. The inflammation frequently extends along the Eustachian tube to the ears. The fever is aggravated towards evening and night, and delirium then supervenes. During the third or fourth day, especially if the eruption fades or suddenly disappears, some internal complication of an inflammatory nature frequently occurs; or an internal affection of an inflammatory or actively congestive kind may have commenced with the appearance of the sore throat, or with the febrile action, and have entirely prevented or delayed, or rendered irregular, the

eruption. In some of these a dark efflorescence continues for three or four days, or even longer, on the backs of the hands, and on the legs and feet. In this state of the disease, internal complications are frequent; the gastro-enteric mucous surface, or the membranes of the brain, or the lungs, or pleura, or even the pericardium, or the peritoneum, evincing a predominance of morbid action; the kidneys being also more or less implicated, although not so manifestly as during convalescence. The patient has complained of, and still experiences pain or aching of the loins and limbs; and the urine is very high coloured, turbid, or even bloody in some cases, and generally scanty, and voided frequently. The inflammatory action in all these complications is modified more or less from the sthenic condition characterising the primary inflammations occurring in persons whose vital influence and circulating fluids are not contaminated by an animal poison or infectious agent. The poisonous emanation which has infected the frame, and is multiplying itself to an indefinite extent, so as to propagate the malady to all who are predisposed to it, reinforced by obstruction of the several emunctories, so changes the states of vital power, of vascular action, and of the circulating fluids, from the healthy sthenic conditions, as very materially to modify the local complications, as respects both the state of vascular action and the morbid products or consequences of that action; so that these complications, although inflammatory in their nature, or as regards the disordered vascular action of the part affected, are imbued by a certain vice or diathesis appertaining to, and imparted by, the specific poison contaminating the frame, and are further affected by the interrupted functions of the kidneys and skin, so as to modify them remarkably from primary, sthenic, or pure inflammations; and the modification is great in proportion to the depressing and contaminating action of the poison, and to the accumulation of excrementitious matters in the blood, — to the adynamic, putro-adynamic or septic character of the fever, — the same relations subsisting between the constitutional and local morbid conditions in this disease as were shown to subsist in other fevers. (See art. FEVER, §§ 109, 110.) Although this type or form of the disease is often complicated, and irregular as respects the eruption, yet it frequently assumes the regular form described above (§ 4.), the febrile action being generally more intense.

20. *C.* SCARLATINA MALIGNA; *Pestilens faucium affectus* of SCAMBATI; *Angina puerorum epidemica* of BARTHOLIN; the *Garotillo* of ZACUTUS LUSITANUS, — the *Pædanchone loimodes* of SEVERINUS;—the *Angina maligna* of DE HEREDIA; the *Malignant ulcerous sore throat* of HUXHAM; the *Purpura epidemica maligna* of SCHULTZ; the *Malignant sore throat* of JOHNSTONE; the *Cynanche maligna* of CULLEN; the *Putrid sore throat* of various authors.—The type of the disease which has been last described passes into this by insensible gradations, not only as respects different cases occurring during the same season, in the same locality, but even in the same family. Sometimes even the attack may present an inflammatory character at its outset, and soon afterwards assume an adynamic, typhoid, or malignant form. But it usually commences in an adynamic or asthenic form, especially in autumn and winter, and in delicate, relaxed, or exhausted subjects, in those debilitated by other diseases, and in weak female children, or those living in low, damp, and close situations. The patient is first affected with languor, lassitude, weakness, and vague pains through the body. These are succeeded by giddiness, chilliness, or shivering, followed by great heat. These latter alternate for several hours, until at last the heat becomes more constant and intense. The patient then complains of faintness, great pain in the head, and of violent sickness with vomiting, or purging, or both, especially in children, more rarely in adults. Heat and soreness are felt in the throat, and stiffness and tenderness in the neck. The face soon appears red or flushed, swollen or bloated, occasionally pale and sunk; the eyes are red, watery, heavy, or suffused. There are great fretfulness, restlessness, anxiety, leipothymia or faintness, and remarkable dejection of spirits.

21. The pulse from the first is quick, small, and fluttering; in some soft and full, but weak and irregular, but always without that firmness and strength observed in inflammatory diseases. Dr. JOHNSTONE remarks, that if blood be taken from a vein soon after the attack, instead of forming a firm crassamentum, "it continues in the state of a gelatinous texture." The urine at first appears crude like whey; as the disease advances it becomes yellower, as if bile were diluted with it; or turbid, scanty, high-coloured, and sometimes it contains dissolved or decomposed blood-globules. At the same time as, or soon after the attack, the fauces, uvula, tonsils, and pharynx become red and swollen; and soon afterwards covered in parts by ash-coloured or dark exudations, which appear as sloughs. The tongue is now deep red or brown, dry and glazed, and sometimes so tender and chapped as to readily bleed. The throat soon acquires a dusky-red, brown or livid hue, and the exudations on the fauces and tonsils are darker, and often cover gangrenous ulcers. The febrile or constitutional disturbance presents an extremely typhoid or asthenic character, or putro-adynamia. The skin is hot; but there is little thirst, although the mouth is dry; and the teeth and lips are covered by sordes, or by an acrid fluid from the excoriated or ulcerated throat. The breath is remarkably fœtid and contaminating.

22. The efflorescence often appears on the second or third day of the disease, and the hands seem as if they were stained by the juice of raspberries. It frequently soon recedes and recurs; and is generally irregular. When it is abundant, it is often dark, dusky, or even livid; and it is often accompanied with petechiæ, more rarely with œdema. The breaking out of the eruption sometimes relieves the vomiting and purging often ushering in the disease. The parotid and submaxillary glands swell and become painful. The neck and throat are œdematous, the swelling sometimes extending to the breast. In this case suffocation is threatened, the breathing being rattling as if the patient were being strangled. A viscid secretion, scanty and adhesive, is produced by the salivary glands; and an acrid thin discharge exudes from the nostrils and from the angles of the mouth, the lips and cheeks exhibiting an aphthous appearance. The affection of the throat often extends along the tubes to the ear; and not only does gangrenous ulceration affect portions of the velum or fauces, but the tympanum and bones

of the ears are destroyed, and an offensive acrid discharge flows from these parts. When the patient swallows the excoriating fluid exuded by the affected throat, diarrhœa, with excoriations of and about the anus, is of frequent occurrence. In these cases the pharynx occasionally is remarkably affected, and is covered by deep sloughing ulcers, extending in some instances to the cellular, muscular and ligamentous structures anterior to the cervical vertebræ and intervertebral substance. The larynx and trachea, the former especially, are not infrequently implicated, occasioning sudden suffocation and death. The lesion of the throat often extends further than the pharynx, and even implicates the upper part of the œsophagus, deglutition being difficult or painful, or the fluids being rejected forcibly through the nostrils.

23. The febrile action is often in young children attended by coma, and generally in older subjects by delirium, which often lapses into coma. The delirium is commonly low or muttering; but it is sometimes violent or frenzied. If it ceases in the morning, it generally recurs in the evening, or is even constant. In the more violent cases, the efflorescence either suddenly disappears or becomes livid; the fauces are black, and the breath most offensive; the eyes lose their lustre, and the swelling of the neck increases. The stools and urine are evacuated involuntarily, the former being frequent, watery, and most offensive, sometimes bloody; the latter, turbid, brownish, or suppressed. The surface becomes cool; the countenance bloated, cadaverous or œdematous; the parts pressed upon excoriated or sphacelated; the tongue brown, hard, or dry; the breathing laboured or interrupted by singultus; and death follows, with insensibility, congestion of the lungs, and great alteration of the state of the blood, and of all the circulating and secreted fluids. This result may appear very early — on the second, third, or fourth day. I have seen it occur on the second day, owing, in some instances, to the extension of the affection of the throat to the larynx, the patient dying asphyxied; in others, to a sudden coma, caused probably by serous effusion and alteration of the blood; and, in some, to congestion of the lungs, the depression of organic nervous influence produced by the poison, and the morbid state of the blood, occasioning or increasing these local changes, and consecutively abolishing the vital functions, especially those of the brain, lungs and heart.

24. *D.* Scarlatina sine Exanthemate. — *S. eruptione*, R. Williams. — Scarlet fever may occur without any eruption, cases of this kind appearing chiefly during severe or fatal prevalences of the malady, and often in the same family in which it pursues a regular course. In this variety the nature of the disease is indicated by the morbid affection of the mouth, fauces, and throat, and by the febrile action, which is generally of an asthenic or low character. Dr. Johnstone remarks respecting the malignant angina, prevalent shortly before the time at which he wrote, that "in some cases people have been seized with a severe angina of this kind without any eruption at all; yet even in these cases a great itching and desquamation of the skin have come on. This, however, has always happened among adults, not at all in children." (p. 33.) — This variety is not always so limited, for I have observed it on several occasions in children, but in them the absence of the eruption appeared to be owing to the internal complication so frequently attending it in them. Dr. Willan observes, that "it is evidently a species of scarlatina, because it affects some individuals of large families, while the rest are labouring under some form of scarlatina, and because it is capable of communicating by infection all the varieties of that disease." Dr. Sims, Ranoë, Eichel, Hagstroem, and Struve, on the Continent, noticed this variety; and Filter, Speun, and others, remarked that desquamation of the cuticle frequently occurred during convalescence nevertheless. Dr. Heberden says, that he has seen the eruption so partial as to be limited to the back of the left wrist. J. Frank, that both he and others have seen many cases of scarlatina without any eruption at all. Mr. Murray mentions the occurrence of twenty cases without any eruption when the disease prevailed at Aford, in Aberdeenshire. Mr. Wood adduces sixteen cases which he observed during the occurrence of the disease in 1832 and 1833 at Edinburgh, in which no eruption was observed, and he considers these cases to have been those of scarlet fever, because none of these patients became afterwards affected with the fever and eruption, though very freely exposed to contagion in the sick rooms and convalescent wards. Dr. R. Williams remarks, that "there is seldom a year in which scarlatina has been in any degree epidemic, that cases have not occurred in which patients, not having previously had the scarlet fever, are seized with severe fever and sore throat, unaccompanied by any eruption; and on subsequent exposure to the contagion of scarlatina, they have been found insusceptible of the action of that poison; and hence it is fairly inferred that the disease they have passed through must have been a variety of scarlet fever." During the many opportunities I have had of observing scarlatina, cases of this variety have come before me; but on no occasion have they been so numerous as in 1848. But it should not be overlooked, that cases of most severe fever and sore throat, with all the indications of malignity, or putro-adynamia, may occur, as I have observed in several cases, in persons who have already had scarlet fever; and they may thus appear in several members of the same family, probably owing to the existence of endemic contaminating causes, to which I have had occasion to impute them. It may appear singular, as indeed Dr. Willan has observed, that the slightest and the most violent cases of eruptive fevers — cases which vary as much in fatality as a flea-bite and the plague — should be associated together and spring from the same origin. Experience has, however, proved that scarlatina simplex, the anginosa, the maligna, and the scarlet sore throat, without the efflorescence on the skin, are merely varieties of the same disease; and that all of them proceed from, and communicate the same infection.

25. There are certain points respecting this variety of the disease which have not been sufficiently investigated; namely, — 1st. Is the non-appearance of the eruption owing to the idiosyncrasy? — 2d. Is this occurrence owing to the existence or severity of some internal complication? —3d. Is it more frequently followed by affections of the kidneys or other sequelæ than the forms of scarlatina already considered. —(*a.*) It is difficult

to determine the degree of influence exerted by *idiosyncrasy* in this or in other maladies, as the reference of an anomaly to this cause is merely an attempt to escape from a difficulty, and even when the most confidently asserted, it is often no more than an unsubstantiated opinion.—(*b.*) As to the *second* point, my experience induces me to conclude, that this variety of the disease is frequently complicated, or followed by dangerous sequelæ; but I am unable to state the exact frequency or the numerical amount of these morbid associations, more particularly in comparison with the other varieties of the malady. I may add, that the fever characterising this variety is most frequently of an asthenic or adynamic kind, even although the affection of the throat may not be very severe or malignant, which, however, it often is, especially in some epidemics; and that complications are frequently found at an early period, upon close examination, but that they are often more or less latent, or masked, until they have reached a formidable height, or they often escape observation, until they are seriously advanced, or are displayed by a *post mortem* inspection.—(*c.*) As to the *third* question, I believe that affections of the kidneys are not merely occasional sequelæ, but are either concomitants or early complications of some cases of this form of scarlatina; for I have observed that the urine has been more or less albuminous in most cases, and even during, as well as after the disease, although dropsy has not supervened. It may be further remarked that obstruction of the functions of the kidneys in the course of the malady, and the consequent accumulation of morbid matters in the blood—the deficient depuration of the blood,—are the causes not only of the consecutive dropsy, but also of the more immediate complications, or inflammatory congestions and sequelæ observed in the course of this and other forms of scarlet fever.

26. *E.* Scarlatina latens.—*Latent scarlatina.*—*Suppressed scarlatina.*—*Masked scarlet fever.*—*Scarlatina without eruption and without sore-throat.* Both in public and private practice, chiefly the former, rare instances of dropsy, especially anasarca, have for many years back come before me, commonly in children, and in families or localities where scarlatina prevailed; and I have been told by the parents that neither eruption nor sore-throat had been complained of previously to the appearance of the dropsy. I generally disbelieved the report, knowing that the mildest forms of scarlatina are most frequently followed by anasarca; and inferred that either sore-throat or efflorescence had existed, but in so slight and evanescent a form as to escape detection. It was not until early in this year (1848) that I became fully convinced of the actual existence of this variety—of a latent scarlatina; and that the constitutional affection may be produced by this specific poison without developing its two principal or characteristic features—the eruption and the sore-throat; the infection causing, nevertheless, lesion of the kidneys, with other concomitant sequelæ of a most dangerous kind. To one of these very serious and complicated cases of latent scarlatina, I was called in this year by my friend, Mr. Joseph Houlton, who had also recognised the scarlatinous nature of the disease, the case having occurred in a house where this malady existed. During 1848, other cases of the same kind came under my notice; all of those, which I then saw having been of a complicated nature; and I have heard of several similar instances from other practitioners. Judging from the cases which I have seen, the dropsy consequent upon this latent form of scarlatina is more severe, complicated and fatal, than when it follows the more regular or usual forms of the disease. Is this owing to an early or premature affection of the kidneys resulting from the scarlatinal poison having prevented the manifestation of the disease in the skin and throat—the predominant lesions in this variety occurring in the urinary organs and serous membranes, and not in the usual situations? And is a certain amount of vascular action, with affection of either the throat or skin, or both, requisite to prevent the consecutive obstruction or lesion of the kidneys, productive not merely of dropsy but also of other concomitant or consecutive lesions? If it be admitted that the morbid effects of the scarlatinal infection or poison are exerted primarily and chiefly on the kidneys and serous membranes or other internal parts in these cases, it may be reasonably inferred that the usual manifestation of the infection on the skin and throat will be thereby prevented and suppressed; and that the danger of the disease will be greater, when these important organs and parts are attacked, than when the skin and throat are moderately and not malignantly affected. Upon referring to authors respecting this variety of the disease, I can find no notice of it excepting in the clinical lectures of Dr. Graves, where he states, that some years ago scarlatina attacked all the children in the family of a medical practitioner, with the exception of one young lady, who, when the children were convalescent, was attacked by anasarca. Her father was much struck with the occurrence, and felt convinced that it was the result of latent scarlatina. One topic as to this variety is worth consideration, viz. the relation subsisting between the infection, the fever caused by it, and the renal and other consecutive affections,—as to whether the disease of the kidneys and the often associated affections of serous surfaces, and of other parts, are the immediate effects of the poison in these cases, no eruptive fever, either with or without its usual concomitants of sore throat and efflorescence having existed; or whether this fever and these concomitants actually preceded the renal and other affections, but in such a slight and evanescent a manner as entirely to have escaped observation. From what I have myself observed, especially during 1848, I conclude that scarlatina may be prevented from being developed on external parts, owing either to the state of the constitution of the person affected, or to the primary operation of the scarlatinal poison on the urinary organs and serous or other structures. That the state of the recipient has something to do with this irregularity, or latent form of the disease, is indicated by the circumstance that most of the patients in whom I have seen it were cachectic or anæmied, their vital energies appearing insufficient for the development of the characteristic local and external manifestations of this malady. It is not unlikely, however, that the primary fever, consequent upon the infection, may have been so slight in all its phenomena as to have escaped detection; and yet, as in the slight but more obvious cases of eruption, to be followed by severe consecutive disease, these

latter cases being admitted to be the most liable to such consequences.

27. iii. COMPLICATIONS OF SCARLATINA.—The complications, or predominant affections of vital organs or parts, constitute the most important topics in the history and pathology of scarlet fever. It may be remarked generally as regards them, that their nature and tendency depend chiefly on the character of the constitutional disturbance—on the states of vital or nervous power, and of vascular action, in connection with the condition of the blood; and that they may be inflammatory, or actively or passively congestive, or either of these associated with so remarkable a loss of vital power and cohesion, as to be rapidly followed by disorganization. In all complications occurring in the course of scarlatina, or of other specific infectious maladies, the local affections should be viewed as prominent lesions only, the whole frame being more or less infected or poisoned by the animal miasm, rather than as independent morbid conditions requiring a special treatment. However inflammatory, or however congestive the complication or prominent disorder may seem in these maladies, it should never be viewed, either pathologically or therapeutically, in the same light as inflammation or congestion occurring primarily or independently of a specific infection. The former has a peculiar character imparted to it by the specific poison, lowering and modifying organic nervous power and contaminating the fluids, whilst the latter is devoid of these poisonous influences and changes, and of their progressive consequences. Accordingly we find that the same means as are successfully employed to remove inflammation, or congestion or effusion, taking place primarily or independently of a specific infection, would be either quite inefficient or even injurious, if employed against these, when supervening as complications or prominent disorders in the course of scarlet fever or other infectious maladies. These latter are imbued with the constitutional characters of these diseases—and partake of the type and diathesis which they manifest.—The most important of the *complications* or *prominent affections* observed in the course of this malady, are — 1st, Congestion or other lesions of the urinary organs; — 2d, diffusive or asthenic inflammation extending from the throat to parts in the more immediate vicinity; — 3d, diffusive, or asthenic inflammation of the gastro-intestinal villous surface;—4th, affection of the membranes or substance of the brain; — 5th, asthenic pleuritis or pericarditis, or both; — 6th, asthenic pneumonia, or congestions of the lungs;—7th, affection of the synovial membranes with effusion into the joints. Other organs or parts may be seriously affected, or even disorganised in the course of, or during convalescence from, scarlatina; but certain of these will be comprised under the head of sequelæ; and two or more of the affections now enumerated may even exist in the same case either coëtaneously, or in rapid succession.

28. *A.* The *kidneys* may become affected in a very prominent manner early in the course of the disease: indeed I believe them to be always more or less affected at an early period, although this affection has been overlooked at this period, and recognised only during the processes of desquamation and recovery. It is chiefly at certain seasons and during certain prevalences of the distemper that this early obstruction of these organs is most remarkable. I have met with it on many occasions; very few authors have mentioned the occurrence even of its usual consequences at this period. JOHNSTONE, however, observes that "in some the face is much bloated and very sallow, the whole neck much swelled, and has a cadaverous look, and the whole body œdematous to such a degree that an impression made with the finger will remain fixed. The breath, towards the fourth or fifth day, becomes more and more fœtid, and the patient spits up a large quantity of stinking purulent mucus, sometimes tinged with blood and of a livid colour." (p. 38.) In the cases attended by more or less œdema, or anasarca, during the period of the eruption, or associated with a deep or dark coloured eruption, the patient, if not delirious or comatose, generally complains of much aching in the loins and pains in the limbs; and the urine either is very scanty, very high-coloured, of a muddy brown, or dark-red colour from the mixture of blood globules, sometimes albuminous; or it is more or less or altogether suppressed. The importance of ascertaining the existence of this complication during the early stages of the disease is extremely great, inasmuch as the issue will depend much upon the treatment adopted for it. I cannot hesitate to state my conviction that, in many cases which terminate fatally at an early period of the disease, whether the eruption be abundant or scanty, or altogether suppressed, this issue is in great measure owing to the early implication of the kidneys having been overlooked; for I have remarked, in many instances, as respects both the symptoms during life, and the appearances of the kidneys after death, sufficient evidence to convince me *that these organs are remarkably congested, and their secreting and tubular surfaces are the seats of a similar vascular injection or efflorescence to that existing in the vascular rete of the skin; and that this efflorescence on the surfaces of the uriniferous tubes, &c., and the associated swelling and congestion of these organs, during the early stages of the malady, either impede, or interrupt, or altogether suppress the function of urinary excretion, and thereby occasion an accumulation of excrementitial and contaminating materials in the blood, and consecutively an increase of the poisonous action of the infected blood upon the nervous system and on vital organs and parts, thereby producing further complications, more especially those about to be described.*

29. In this early period of the disease, the interrupted functions of the kidneys, produced in the manner now stated, has the effect not merely of preventing the discharge by these emunctories of the usual excremental matters in the blood, but also of arresting the evacuation of those morbid materials evolved in the blood from the action of the infectious miasm upon the nervous and vascular systems. The obstruction of the kidneys, arising as just explained during the early stage of the disease, produces a more immediate and a more intense or acute effect, than the obstruction so frequently caused subsequently, and during or after the process of desquamation, by the accumulation and infarction of the epithelium scales thrown off from the uriniferous tubes. The obstruction in the uriniferous tubes, caused by the accumulation of epithelium scales in them during

this latter period, is entirely the result of a species of desquamation, as respects these tubes, consequent upon the vascular action, congestion, and tumefaction of which they, with other parts of the kidneys, are the seat in the eruptive or early stage, and which, in this stage, frequently becomes, as just stated, the source of the most acute and fatal complications. The obstruction of the kidneys in the early stage, arising, as now shown, is often more complete and rapid in its accession, than that which follows in the last stage as a process of desquamation, and hence the consequences are generally not so severe nor so fatal in this last stage, especially when due precautions are used during the period of desquamation.

30. *B. Inflammation* of a more or less *asthenic* or *diffusive kind* may extend in more than one direction from the throat, especially in the more malignant states of scarlet fever; and this complication may be more frequent in certain seasons and epidemics than in others. — (*a.*) The most dangerous and rapidly fatal of these extensions of the local affection are *laryngitis* and *tracheitis*. When the angina attending scarlatina is not of a malignant kind, and when the pulse and affection of the throat do not indicate much vital depression or malignancy, the epiglottis and larynx very rarely betray any disorder. But in malignant cases, and in adults, especially those who have been addicted to the use of spirituous liquors, or whose constitutions are broken down, this extension of inflammation to the larynx and trachea, and consequent asphyxia, are not rare. In most of these cases the larynx is only or mainly affected; but in others, especially in children, the trachea is also implicated. In the more malignant cases, death may occur in little more than twenty-four hours from the commencement of the attack, owing to this complication. Of this I have met with two or three instances, in adults, one in a man aged between 50 and 60. In the cases of this kind which I have had an opportunity of examining after death, there was much firm lymph exuded over the tonsils and pharynx extending into the larynx, the tissues underneath being swollen, injected, and œdematous.

31. (*b.*) *Pharyngitis* is generally present in a greater or less degree in most of the severe cases of the anginous form of scarlet fever, and more especially, and in a most asthenic form, in the malignant variety. In many of these, especially in certain epidemics or seasons, the morbid action extends to the posterior nares, the nostrils and fauces, on the one hand, and to the upper portion of the œsophagus on the other, and is accompanied with the exudation of greyish lymph which coagulates on portions of the affected surface, and imparts the appearance of sloughs. In some cases, instead of this exudation, an acrid or sanious discharge of an excoriating nature is observed with sloughing ulcers, but these latter are more frequently found in some epidemics of this malignant malady than in others. In most of these cases attempts at deglutition are either very painful and difficult, or altogether abortive, matters being thrown out through the nostrils on attempting to swallow them. Sloughing ulceration is most frequently observed in the tonsils, and is more rare in the fauces, pharynx, or its vicinity; but this and other changes in the throat vary much in different epidemics. They are observed chiefly in the most malignant cases; and even in more rare instances of this kind which recover, the morbid action has extended posteriorly to the tissues and parts between the pharynx and bodies of the cervical vertebræ, until these latter, and the intervertebral substances and ligaments, have become implicated, and dangerous, if not fatal, sequelæ have followed the pharyngeal complication. Of this I have met with several instances in the course of practice (§ 47.).

32. (*c.*) The extension of the anginous affection along the *Eustachian tubes to one or both ears*, is a frequent and most distressing complication of the more severe states of this fever, and is not infrequently attended by destruction of portions of the soft palate, and of the small bones and membrana tympani of the ears. In some instances, caries of a portion of the temporal bones, and the extension of irritation and inflammation to the membranes, and even to the substance, of the brain, have followed, either immediately or remotely, upon the occurrence of an *asthenic otitis* in the course of malignant or severe scarlatina. In these cases, a discharge more or less copious, and always offensive, takes place from the ears, and in rare instances even *hæmorrhage* from the ears occurs. I have not observed any instance where the hæmorrhage from the ear has been excessive; but Dr. GRAVES has adduced a case in which it was so great as to prove fatal; and it has also been noticed by FOTHERGILL.

33. (*d.*) *Epistaxis* may occur in the course of scarlatina from very different pathological states. It may attend, or appear early in, the stage of eruption, especially in plethoric children, in those accustomed to epistaxis, or in those of a sanguine temperament and hæmorrhagic diathesis. If it be moderate, or even considerable, it may alleviate the cerebral symptoms, and be even critical or beneficial. This, however, occurs chiefly in the more inflammatory states of the disease. But when it is excessive, or when it accompanies the malignant form, it may be only one of the modes in which a fatal issue takes place. Even in the more inflammatory or sthenic forms of scarlatinal angina, an intercurrent epistaxis may be so excessive as to lower the power of vital resistance, and the patient may sink either from exhaustion, and from the want of correspondence between the capacity of the vascular system and the amount of blood contained in this system; or he may suffer another complication, favoured if not more directly caused by the hæmorrhage, namely, the extension of inflammation, in an asthenic or diffusive form, to the cellular tissue and glands of the neck. When epistaxis occurs in the course of malignant scarlatina, and is preceded by an offensive discharge from the mouth, nostrils, or ears, it may be viewed as a consequence of gangrenous or sloughing ulceration of the fauces, pharynx or posterior nares, and generally it then hastens or causes dissolution. Epistaxis and bleeding from the throat, in these circumstances, are not rare, and have been noticed as more frequent occurrences in some epidemics than in others. These complications have been mentioned by HUXHAM, FOTHERGILL, GRAVES, and others. FOTHERGILL remarks that "the sick sometimes bleed at the nose towards the beginning of the disease; and the menses very often appear in those of the female sex who are of an age to have them."

(*Works*, vol. i. p. 375.). And at another place he states that, "it has happened in this distemper that hæmorrhages from the nose and mouth have suddenly carried off the patient. I have heard of the like accident from bleeding at the ear. But these fatal discharges most commonly happen after the patient has been ill several days; and it seems more probable that they proceed from the separation of a slough, rather than from a fulness of the vessels, or an effort of nature to relieve herself by a salutary crisis." (p. 376.)

34. (*e.*) *Diffusive* or *asthenic inflammation of the cellular tissue* of the neck is one of the most dangerous complications of scarlatina, and is apt to occur when the throat is most malignantly affected. Dr. Johnstone has remarked upon the frequency of this complication in the epidemic scarlatina of 1778. "The parotids also swell," he states, "grow hard and painful to the touch, and, when the disease is violent, a large œdematous tumour surrounds the neck, extends to the breast, and greatly increases the danger. The breathing then becomes more difficult, with a kind of rattling noise as if the patient was suffocating." This extension of the disease to the glands and cellular tissue of the neck is frequent during the prevalence of malignant scarlatina. I have often observed it, and it has been duly remarked upon by Dr. Kennedy, Graves, Osbrey, Charlton, and others. This diffusive state of inflammation may be greatest on one side, or it may surround the whole neck and throat and descend to the pectoral muscles. It may accelerate or cause death before passing into gangrene or suppuration, into either of which it may rapidly lapse; and it may exist with the eruption or without it, or the parts affected only may present a dark or dusky erysipelatous hue. It is evidently the result of local contamination, spreading from the ulcerated and infected throat; and it may supervene either as a complication or sequela of the distemper; but however it may appear it requires the intentions and means of cure described in the article on diffusive inflammation of the Cellular Tissue.

35. C. *Asthenic or diffusive gastro-enteric disorder* is a very frequent complication or prominent affection in the more malignant cases of this malady. It may occur either with, or without vomiting, or it may only commence with this symptom; and it may be attended by an eruption of a more or less deep tint; or it may cause the sudden suppression, or the non-appearance, of the eruption. It may be caused by the passage of the excoriating discharge from the throat into the stomach, especially in children who seldom spit out the discharge, the gastro-enteric surface being irritated or excoriated by this morbid matter; or it may arise primarily as a prominent phenomenon of this fever, and by its increase, or general diffusion over the digestive mucous surface, prevent the evolution of the efflorescence on the cutaneous surface. Dr. Johnstone remarks, that the acrid matter passing from the throat into the stomachs of children is "one reason why they are attacked with these violent gripings, dysentery, and excoriations of the anus and buttocks which sometimes attend the distemper, and show that the sanies retains its virulence throughout the alimentary canal." (p. 39.)—The same statement had, however, been made by Dr. Fothergill thirty years previously, and nearly in the same words (*see his Works*, vol. i. p. 374.). Huxham also remarks that a sudden stoppage of the discharge from "the mouth and nostrils actually choked several children; and some swallowed such quantities of it as occasioned excoriations of the intestines, violent gripings, dysentery, &c., nay, even excoriations of the anus and buttocks." (*On Fevers*, p. 280.) Dr. Graves adduces a case in which these excoriations were observed around the anus, but in it the cutaneous eruption was intense. In most of the cases in which I have observed irritability of stomach and diarrhœa, with or without excoriations of the anus, in the course of scarlatina, the eruption was either suppressed, or partial and scanty, or prevented from appearing, the throat, however, being more or less affected. In the first two cases of this complication which came under my care, and which I attended with Dr. Clutterbuck in 1821, the eruption disappeared, diarrhœa occurred, and profound coma, with unconscious evacuations, supervened and further complicated the disease. Nevertheless both cases recovered. When diarrhœa complicates this distemper, especially in children, coma, or convulsions, or insensibility from vital exhaustion, not infrequently supervenes. When the diarrhœa is moderate and not attended by vomiting, and when the evacuations are bilious or feculent, then it may be salutary, or at least not injurious; but when it is consequent upon severe affection of the throat, or is attended by œdematous swelling of the neck, or is severe, the stools being watery or slimy, muddy, and very offensive, it is liable to be followed by coma or fatal exhaustion.

36. D. *Convulsions*, *coma*, and *tremors*, are frequently observed in the course of the more severe cases of scarlatina, and in the more nervous form of the disease; or in children of a nervous and susceptible temperament, convulsions, delirium, coma and tremors may occur in succession. These complications, like many others, may appear either when the eruption is very full and general, or when it suddenly or prematurely fades, or when it becomes partial or recurrent; but generally the skin continues hot and dry.—(*a.*) In very young children, *convulsions* may take place at or during the commencement of the distemper; and in this case they generally usher in a malignant or severe attack; and they may not appear afterwards. But they may occur at any period, or not until near the fatal termination of the disease. They are seldom attended by squinting, and the pupils of the eyes are rarely dilated—generally they are contracted.—(*b.*) Coma may supervene very early; but in children above five or six years of age it is generally preceded by delirium, and, in children under this age especially, it is often attended by partial convulsions. When coma takes place early in the disease, it cannot be imputed to serous effusion between the membranes or in the ventricles of the brain; but rather to congestion or to a loss of cerebral power; and, even when it supervenes at a more advanced period, it is to be attributed rather to these states than to effusion, although vital exhaustion and the morbid state of the blood may also be concerned in causing it. In most instances, and in whatever stage of the disease in which it occurs, the pupils are generally contracted. Although a dangerous, it is not a fatal complication, for I have seen several patients re-

cover from it.* When, however, it is attended by disappearance of the eruption, by a glassy state of the eyes, pallor and sinking of the features, tremors or startings of the tendons, and other signs of sinking of the powers of life, a fatal issue soon follows. Coma, convulsions, and other nervous symptoms, may occur also as *sequelæ* of scarlet fever, but generally in connection with renal obstruction and anasarca (§§ 41 *et seq.*).

37. *E. Congestion of the lungs, bronchitis, congestion, or asthenic pneumonia*, and even combinations of these, with or without *pleuritis*, are frequently prominent affections in the course of the more severe forms of scarlet fever. In most instances both lungs are affected, and bronchitis and lobular pneumonia are not infrequently associated, or are rapidly consecutive of each other. In the most severe cases, the general diffusion of disease through both lungs, added to other existing morbid conditions, has terminated life in from thirty to forty hours, or even in a shorter time, after the first appearance of the pulmonary complication. In these cases the substance of the lungs soon become solidified, especially in parts, and infiltrated with a bloody serum; the state of congestion insensibly passing into asthenic solidification, or splenization, especially in the posterior or depending parts. The complications now mentioned may also occur in the milder or less malignant states of the disease; but generally either in an advanced stage or as sequelæ; and in these circumstances they approach nearer to the usual character which these affections present, although more or less modified, and requiring, owing to the state and nature of the constitutional disturbance and contamination, a peculiar mode of treatment.

38. *F. Pleuritis* and *pericarditis* may take place either separately or in combination, or in connection also with affection of the lungs. The occurrence or association of these varies much in different epidemics and seasons, whether appearing as complications or as sequelæ of scarlatina. As *complications* they are met with chiefly in severe or irregular cases, in which the eruption either is suppressed or does not appear; and, as *sequelæ*, they most frequently follow mild cases, and in connection with anasarca and disorder of the urinary excretion; and, in these circumstances, they are soon followed by effusion, especially into the pleural cavities. These prominent lesions may exist and escape detection, either until they are far advanced, or until disclosed by a post mortem examination. This is particularly the case with respect to pericarditis, and even as regards pleuritis. A very careful and frequent examination is required to determine its presence in young children during the severer states of the malady.

39. *G. Peritonitis* may appear as a complication of scarlatina, either consecutively of diarrhœa and vomiting, or independently of these. I have, however, rarely met with it during the stages of eruption; but more frequently as a sequela of the malady, and in connection with obstruction of the kidneys and anasarca. It may generally be recognised, at whatever period it occurs, by the tenderness, fulness, and tension of the abdomen; by vomiting, and the heat and dryness of the surface of the trunk; and most frequently by the disappearance of the eruption. It usually soon terminates in effusion and in death, if not early detected and treated by means which will arrest the morbid action without depressing the vital energies, an intention which on a few occasions may be accomplished.

40. *H. Affections of the joints, erysipelas, gangrene*, &c. may occur during an advanced stage of the more malignant states of the distemper, or even as sequelæ, during the period of desquamation, and, with the rest of the complications already noticed, are to be attributed chiefly to the following pre-existing changes: — 1st. To the change produced by the infectious miasm upon the organic nervous influence and vascular system. — 2d. To the alteration of the blood arising from this primary change, and from the action of the miasm on the constitution of the blood itself. — 3d. To the active congestion, obstruction, and consecutive changes taking place in the kidneys at an early stage as well as during the periods of desquamation and convalescence, whereby the blood is further changed by the accumulation of excrementitial elements or materials in it, owing not only to the obstruction of the kidneys, but also to suppression of the functions of the skin, — two of the chief emunctories, by means of which effete and hurtful materials are carried out of the circulation, — these two chief organs of depuration being more or less interrupted or obstructed in their functions, during this disease. Owing to these consecutive series of changes, serous effusions take place not only in the larger shut cavities, with more or less irritation or asthenic inflammation of serous membranes, but also into the cavities of the joints, irritating the synovial membranes, and eroding the cartilages. Owing to these changes also, the internal surface of the blood-vessels, in predisposed parts, become inflamed or obstructed, and eliminating surfaces irritated or diffusively inflamed; the affected parts, owing to the depressed state of organic nervous power, and to the morbid condition of the blood circulating in it, soon losing their vital cohesion, and passing into sphacelation, — changes readily accelerated and increased by pressure and the contact of morbid secretions or excretions.

41. III. THE SEQUELÆ OF SCARLATINA. — Having given the *complications* or prominent local affections of scarlet fever that amount of consideration which their importance demands, and which has not been accorded to them by previous writers, and having pointed out the sources or causes of their origin, of their severity, and of their fatality; and having stated that an attentive examination of the early as well as of advanced phenomena of scarlatina, and the lesions observed after death, *show these sources or causes to be chiefly, or in great measure, the changes which take place in the kidneys at a much more early period of the distemper than has hitherto been believed*, I now proceed to consider the more important *sequelæ* of the malady, and with due reference to their sources. If the inferences at which I have arrived from an

* HILDENBRAND observes: — "Insignem vero, et quasi innatam, febris scarlatinæ miasma ad membranas serosas, et in primis ad membranam arachnoideam encephali habet proclivitatem, ita quidem, ut non solum exanthemate derepente represso vicariæ in cerebro libentissime subnascantur reactiones, verum etiam lætissime florente manifesta evolvantur congestionis cephalicæ, aut veræ encephalitidis, indicia. Quod autem arachnoidea, et non alia patiatur meninx, effusiones serosæ in peremptorum cadaveribus conspicuæ evincunt." — (*Institut. Pract. Med.* t. iv. p. 383.)

attentive observation of the phenomena of scarlet fever be received, the sequelæ as well as the complications of the disease may be assigned to nearly the same sources. The *primary* obstruction of the kidneys is chiefly concerned, as shown above (§§ 28, 29.), in rapidly developing or increasing the *complications*, aided, however, by obstruction of the functions of the skin; and the *secondary* or consecutive obstruction of the same organs is equally concerned in producing the *sequelæ*, as already stated (§ 29.), and with the same aid. The very same organs, surfaces, or parts which are the seats of the complications or prominent affections, may also be seats of those lesions which constitute the sequelæ. Indeed the local changes described above as complications may appear so late in the disease as to be considered with propriety as sequelæ, whilst those usually denominated and viewed as sequelæ, may supervene so early as to deserve the former appellation.

42. It has been stated above, that the complications are most apt to occur in the more severe states of the distemper, whether inflammatory or malignant; and that the early affection of the kidneys — as early probably as the occurrence of horripilations, faintness, vomiting, pains in the back and limbs, &c. ushering in the attack, or soon after this period, — by obstructing the functions of these organs, and thereby augmenting the contamination of the blood, increases, in the first place, the intensity and malignancy of the febrile action — of the constitutional disturbance; and, with such increase, next developes local lesions of a severe or fatal character. The state of the skin probably aids also in producing these effects. If this be admitted in respect of the more severe cases, it follows, that the milder cases of the malady are attended by a much more slight affection of the kidneys, and that the urinary secretion does not manifest so much disorder or obstruction in these latter cases as in the former. Now this is exactly what is usually observed. But it has been very generally stated, that these milder cases are most likely to be followed by renal disease and dropsy. This is partly true; and is observed to obtain in some seasons more than in others, and more especially in certain epidemic prevalences of the distemper. It may be inferred, from what I have stated, that the sequelæ should be the most severe after the most malignant cases; but the obstruction of the urine in many of these is such as fatally to increase the malignancy; and those who recover very frequently experience a general and profuse perspiration, or copious discharges from the alimentary canal or other parts, which are somewhat vicarious of the obstruction of the kidneys, or which derive from these organs and diminish the consecutive affection. Besides, the amount of the consecutive obstruction may not be always great in proportion to that of the primary affection; for this may be rapid in its accession, and great in its amount, in respect both of the secreting structure and of the uriniferous tubes, and yet the obstruction caused by the desquamation of the epithelium, or the accumulation or infarction of the desquamated epithelium in the tubes, may not be so great as to cause any serious change either in the blood, or, through it, in other parts. When the functions of the skin are restored, and determinations of blood towards the kidneys, and congestion of these organs, by exposures to cold and other causes, are prevented, the desquamation of the uriniferous tubes may take place gradually and without obstructing the urinary excretion, whilst such obstruction would very probably occur if the kidneys were the seats of vascular determination or congestion, caused by constriction of the cutaneous surface, and by the arrest of the cutaneous excretion.

43. The frequency of sequelæ arising out of the obstruction of the kidneys, and the severity of these sequelæ, often are greatest after very mild cases, and in the latent states of the disease (§ 26.). So very remarkably is this the case, as respects the latent form, and so dangerous are the associated affections sometimes attending this form, that I have had reasons to doubt whether the obstruction of the kidneys was, in this form, actually consecutive of an antecedent febrile attack, unattended by eruption or sore throat, or whether it was the primary change produced by the infectious miasm, which, instead of developing either a cutaneous eruption, or a sore throat, had affected the kidneys in so severe a manner as to prevent the more external evolution of the disease, and to obstruct the urinary excretion, thereby increasing the contamination of the blood, and the amount of its watery constituents, and occasioning other dangerous consequences, more especially the several forms of dropsy, with or without irritation or inflammation of vital organs or of serous membranes. However the renal obstruction may arise, — whether *secondarily*, as usually admitted, or both *primarily* and *secondarily*, as now first contended for, or sometimes *primarily only*, as just suggested — the consequences of its existence upon the state of the blood must be most serious. The blood necessarily becomes altered, both as respects an increase of its watery constituents and of its saline and solid ingredients, and, as regards the formation of injurious materials from the elements furnished by the processes of ultimate assimilation, of absorption, and of imbibition or endosmose, even independently of, and in addition to, the more special changes produced by the poisonous miasm, or infectious ferment, in the progress of the development of its effects and of the multiplication and dissemination of its kind. The more manifest consequences as regards the blood are an increase of the serous portion, and a diminution of the vital crasis, of the fluid and of the cohesion of the crassamentum. The globules or molecules which concrete into fibrine, either partially or altogether cease to cohere in such a manner as to form this substance, causing an apparent deficiency of fibrine, although these globules or materials which form it are actually not deficient, or are even in excess. The depression of organic nervous or vital influence, and the primary and secondary changes of the blood, diminish or otherwise affect the fibrine by depriving the globules, or the material principle constituting this substance, either partially or completely, of the power of cohering so firmly as to produce it, with its characteristic properties, more especially in the advanced stages of the distemper.

44. The consequences of an excess of the watery portions of the blood, and of the other excrementitial matters, and of the existence of other injurious products, which may be reasonably inferred to be present, although not admitting of demonstration, may be briefly stated as follows:

— 1st, The development of irritative fever, the pulse becoming very rapid, vital power depressed, and the skin burning, &c.;—2d, Over-distension, oppression, or congestion, of the vascular system, more particularly of the veins and capillary vessels, in predisposed and weakened organs:—3d, With the continuance or progress of these states, asthenic irritation or inflammation, with more or less effusion, serous or sanguineous, into serous cavities, or into cellular or parenchymatous structures, according as pre-existing conditions, or previous lesions or predispositions may favour their occurrence.—Thus we observe, not only as *complications* of the several stages of scarlet fever, but also as *sequelæ* during desquamation and convalescence, various modifications and associations of the pathological conditions just stated—modifications and associations caused by states of predisposition, by the dose or amount of the infecting animal poison, and by the grade and kind of alteration produced in the circulating fluids, and consecutively in serous, mucous, and cellular parts.

45. Having shown the origin of the chief *sequelæ* of scarlet fever to be obstruction of the kidneys, frequently aided by constriction of the vessels, and obstruction of the functions of the skin, but as frequently arising without such aid, it is unnecessary to add more than to briefly notice the chief affections which supervene, either from this cause, or from the disease of the throat, during desquamation and convalescence. Certain of these require merely an enumeration at this place, although they are most important as respects the amount of lesion which attends them; but these lesions, when thus produced, are more fully considered under those heads to which they more legitimately belong—namely, as consecutive alterations or diseases of the structures or organs in which they are seated. Although obstruction of the functions of the kidneys and skin, with more or less of structural change of the former, is productive of a large proportion of the sequelæ of this malady, still the lesions, which were situated in the throat and its vicinity during the early stages, either by their continuance, their extension, or their severity, or by their recrudescence, owing to obstruction of the depurating functions, or to exposure to cold or humidity or currents of air, sometimes deserve to be ranked among the most serious sequelæ of scarlatina.

46. *A.* The most important of the sequelæ which are produced chiefly by the affection of the throat are, *the extension of disease to the ear*, with the consequences of this extension, especially destruction of the small bones of the organ; inflammation, ulceration, and perforation of the tympanum; chronic otitis with offensive discharge; inflammation, and ulceration of the membrane lining the cochlea and semicircular canals; caries of the petrous portion, or mastoid process, or other parts of the temporal bone; and even the extension of inflammation, suppuration, or ulceration to the membranes and substance of the brain, may supervene, and, as respects these latter changes especially, not infrequently at remote periods from the primary affection of the throat and the extension of lesion to the internal ear. When disease of the ear is so far advanced as to implicate the bone in which the organ is lodged, the consequences are serious, not only as respects the organ itself, but also as regards adjoining vital parts, the affection of which often occasions great and protracted suffering, and ultimately fatal results. (See arts. BRAIN AND ITS MEMBRANES, §§ 58. *et seq.* and EAR, §§ 20. *et seq.*).

47. *B.* The extension of inflammation, and even of ulceration from the posterior *pharynx to the cellular, muscular*, and *ligamentous tissues interposed between this part and the base of the cranium and upper cervical vertebræ*, has been noticed above in connection with the advanced courseof the malady (§ 31.). But this lesion is met with not only as a complication, but also as a sequela of scarlet fever. In either form, in the latter more especially, it is often attended by spasm, contraction, or painful distortion of the head or neck; and in this state, the lesion has often been viewed as merely consisting of irritation, or of simple "crick in the neck," or of rheumatism from cold, and been overlooked until it has advanced to disease of the intervertebral substance, to destruction of the ligamentous or cartilaginous structure, and even to *caries* of the bones at the base of the skull, or of one or more of the cervical vertebræ, with thickening of the ligaments and of the theca of the canal, and complete or incomplete, partial or general paralysis. Of this sequela I have seen several instances, and two of complete recovery, with much shortening and stiffness of the neck from destruction of one or two of the cervical vertebræ, and ossific adhesion of those adjoining.

48. *C.* The *parotid glands*, the *lymphatic glands*, and the adjoining *cellular tissue*, are not infrequently enlarged, congested, or inflamed after an attack of scarlatina, especially in scrofulous subjects, and in delicate persons residing in low, damp, or unwholesome situations. These are often merely the persistent or exacerbated states of the same affections which commenced at an early period of the fever; but they sometimes do not appear until much later, and although the connecting cellular tissue may be somewhat swollen, it is much more rarely the seat of diffusive inflammation than in the early stages of the malignant form of the disease. Whether existing merely as the remains of an early complication, or as a more or less remote sequela, these affections are often troublesome, especially when they advance to chronic suppuration or abscess, as most frequently is the case in these circumstances; enlargement of the parotids often accompanying the other sequelæ of the disease.

49. *D. Affection of the kidneys, after scarlatina, and its consequences.*—(*a.*) When the pulse continues very quick or sharp after scarlatina, for a longer time and in a more marked degree than may be attributed to debility merely, or to some degree of anæmia, the continuance of irritation in an internal organ or part, or the existence of obstruction of a depurating or excreting organ may be inferred; and the same inference may be drawn, although the febrile symptoms had subsided, from the recurrence or supervention of this state of the pulse, during or after desquamation, especially if there be also present languor and peevishness, heat and dryness of the skin, nausea or vomiting; pain or aching in the loins and limbs, drowsiness or stupor. When these symptoms appear, or if, with these, the tongue is loaded or furred, the bowels costive or irregular, and thirst increased, with or without horripilations,

then should the urine and the region of the kidneys be carefully examined, and the approach of *œdema* or *anasarca* be expected, if indeed either be not already present. In many cases the symptoms which precede the anasarca are so slight as to escape observation until œdema or fulness of the face, or indications of commencing anasarca evince the nature of the affection. In other instances the febrile commotion, with the symptoms now mentioned, are more or less manifest for a short time before, and contemporaneously with, the first appearance of anasarca. In every case the urine is at first scanty, often high-coloured, or turbid and albuminous; it is more rarely bloody, or of a pale red colour; sometimes it resembles water in which flesh has been washed; and there is always a frequent desire to pass it. In the less severe cases the urine is more copious, but is still turbid, and sometimes it contains numerous small fibres consisting chiefly of epithelium floating in it. After the face, the feet, ankles, wrists and hands first become œdematous; and in some instances the dropsy may not advance much farther; but more frequently the trunk and body generally become anasarcous; and in the more severe cases, or when the urine is very scanty, bloody, and albuminous, or altogether suppressed, either contemporaneously with the incipient anasarca, or during its progress, symptoms of effusion on the brain, or in the cavities of the chest, or in the abdomen, or even in all, make their appearance and sometimes rapidly terminate life. These rapid and complicated cases of effusion are, in some epidemics, more frequent than in others, and are more especially so in the latent form of the disease (§ 26.), or when there has been no antecedent eruption or sore throat, or when the disease is apparently attacking the kidneys and serous surfaces primarily, the evolution of its more external features being thereby prevented. The vascular excrementitial plethora produced by the obstruction of the kidneys occasions effusion into cellular parts, effusion from serous membranes, and asthenic or diffusive inflammation or œdema of parenchymatous organs, which, with the morbid state of the blood produced by the urinary obstruction, become the more immediate causes of death, but chiefly in the severer forms and more complicated states of the disease.

50. (*b.*) *Anasarca* and its *morbid associations* may occur at any period after the eruption, as well as more rarely, but occasionally, in some epidemics, even during the eruption; but commonly from the fourteenth to the twenty-eighth day from the commencement of the disease, the 21st, 22d, 23d, and 24th days, being those in which it most frequently appears. The proportion of instances in which these sequelæ or reliquiæ of scarlatina are observed differs much in different seasons and prevalences of the distemper. The dryness or humidity and temperature of the air, the weather, the prevailing epidemic constitution, and the treatment, must necessarily cause considerable differences in the ratio of these sequelæ at different times. Dr. WILLIAMS states that at HERIOT'S Hospital, in 1832 and 1833, nine cases of dropsy occurred in forty-five; and that in the London Foundling Hospital only three were affected with dropsy out of 100 cases of scarlatina. Mr. HAMILTON says, that a larger proportion of the numerous cases of scarlet fever which he attended in Edinburgh in 1832 and 1833, became dropsical. According to my observations, dropsy from obstructed kidneys, in all its forms and associations, have been common consequences of scarlet fever for several years up to 1848, during which year it was most frequent, and most complicated. But it appears to have been more or less frequent in all epidemics of this fever which have been fully described; the two occasions of its rare occurrence just mentioned being the most remarkable with which I am acquainted.

51. (*c.*) The *origin* of this dropsy was formerly ascribed to the state of the skin, and especially to obstruction of transpiration from this surface, in connection with loss of tone of the capillaries supplying the parts in which the effusion occurred. More recent researches have shown that, however these states may aid in the production of these sequelæ, the affection of the kidneys should be viewed as the chief source of the effusion, and even also of the asthenic or diffusive inflammation and irritation of one or more vital organs sometimes associated with effusion into the shut cavities, whether occurring as complications during the eruption or as sequelæ (§§ 28. 41.).

52. (*d.*) In the most favourable cases œdema, or slight anasarca, may only occur and be ushered in, as already stated (§ 49.), with acceleration of the pulse, scanty urine, and other febrile symptoms. But the anasarca may be excessive; or, even without being excessive, effusion of serum may also take place in the *brain*, in both *cavities of the chest*, in the *pericardium*, or in the *peritoneal cavity*. It more rarely is confined to one cavity than extended to nearly all, although in different degrees. As far as I have observed, when it takes place into the pleural cavities, a slight effusion is not infrequent into the pericardium also; and the *lungs* and *pleura* are then sometimes *inflamed*, but more frequently *congested*; inflammation rarely advancing further than the state of splenization, but usually evincing the appearances of congestive or diffusive inflammation.

53. (*e.*) Effusion into the ventricles, or between the membranes of the *brain*, may take place without effusion into any other cavity, and even without anasarca; but it may also be associated with one or more of such affections. When it occurs as a sequela of scarlatina it is generally not so rapid or acute as when it appears as a complication, nor is it so frequently attended by convulsions; although the stupor or coma may be as profound, and the organs of sense as much affected.

54. (*f.*) Effusion into the *cavities of the chest* is generally preceded by anasarca, by congestion or inflammation of the lungs or pleura, or of both; and is sometimes attended by œdema of the lungs, and by effusion into the pericardium. The affections of the lungs and pleura, with effusion, are the most frequent internal complications of the anasarca, or remote consequences of the renal obstruction; effusion into the peritoneum being very much less common. The associated affections of the lungs and pleura are generally far advanced before they are fully manifested — are more or less latent in their early stages, and are seldom confined to one side, although one lung or pleura may be more diseased than the other. Dropsical effusion into the *peritoneal cavity* is generally preceded by œdema or anasarca, being in some instances an association of the latter; or

by diarrhœa. It is occasionally attended by signs of inflammatory irritation of the membrane, but these signs may have been wanting or obscure, although indications of general peritonitis with effusion are found upon dissection; the early supervention of effusion probably removing the more severe local symptoms, as well as partially resolving the attendant inflammatory state.

55. (*g.*) *Renal disease* and *dropsy*, as sequelæ of scarlet fever, may occur in patients of any *age;* but much more frequently in *children* from two or three years of age up to thirteen or fourteen. They are most common in the ill-clothed and ill-fed, and in those who live in low cellars or on ground floors, and in cold damp situations, or who are exposed to cold or vicissitudes of weather soon after or during desquamation. They are much more rare in the children of parents in comfortable circumstances than among the poor; from a fourth to a third or even more of the cases of the latter being probably thus attacked, especially in some epidemics, and late in autumn and beginning of winter. There is probably hardly a case of dropsy after scarlatina, or of inflammation of an organ or serous surface, particularly when associated with dropsy in connection with this disease, that has not its origin in renal obstruction, although the interrupted functions of the skin, and the antecedent states of the blood, caused by the infectious miasm, may be admitted as concurrent causes. The kidneys are, however, so generally implicated, as I have contended above (§§ 24. 28. *et seq.*), in all the stages of scarlatina — both primary and secondary—as to allow the inference, that the affection of these organs may exist in a grade sufficient to occasion indications of its presence, if attentively enquired after, and especially the symptoms mentioned above (§ 49.), with more or less alteration of the quantity, appearances, and constituents of the urine, without producing such obstruction of this excretion, or such change of the constitution of the blood, as to be followed by dropsical effusion, this result supervening chiefly in the more acute and complete states of the affection of these organs. The consecutive inflammations, so frequently associated with the dropsy, also chiefly depend upon the renal obstruction, aided however, as just stated, and as already more fully shown (§§ 44, 45.), by the states of the skin and antecedent alterations of the blood.

56. (*h.*) The renal and dropsical affections consequent upon scarlatina, especially when severe, are often followed, during convalescence from them, by more or less *anæmia;* the alteration of the constitution of the blood — the contamination of the blood, directly and indirectly, by the infectious miasm, and consecutively by the obstructed emunctories — not only impairing the vital crasis of this fluid, but also hastening the changes in, and the destruction of, the red-globules or hæmatoglobulin, whilst the primary and secondary functions of assimilation — the formation of healthy chyle and the conversion of chyle into blood, or of the chyle-globules into blood-globules — are slowly and imperfectly accomplished, owing to the debilitated state of the several assimilating organs.

57. (*i.*) *Inflammation*, generally of a diffusive or asthenic kind, and attended with more or less effusion of a turbid serum, when the serous surfaces are implicated, not infrequently is associated with the consecutive dropsy; but it also, although much more rarely, occurs independently of any antecedent or attendant œdema or anasarca. When thus complicated, and even when occurring simply, it is generally owing to the state of the blood, arising, as shown above (§§ 43. *et seq.*), from the primary and consecutive changes of this fluid, and the existing disturbance of the urinary and cutaneous excretions. The organs and surfaces which are most liable to be thus secondarily inflamed, either in connection with, or independently of, dropsical effusion, are the *membranes* of the *brain*, the *lungs* or *pleura*, or *both*, the *pericardium*, the *peritoneum*, the *synovial membranes*, the *parotid glands* and the *integuments;* and it is not rare to find not merely one, but two or more of these to be affected in the same case, more especially when the affection is associated with *dropsy*, and with manifest disorder of the *kidneys*, and with *albuminous* or otherwise *morbid urine* (§§ 60. *et seq.*)

58. (*k.*) Enlargement and chronic inflammation of the *parotid glands*, with effusion of serum, lymph, and puriform matter into the surrounding *cellular tissue*, and engorgement or inflammation of the *lymphatic glands*, are amongst the most frequent sequelæ of scarlet fever, and are often associated with œdema or anasarca, or with inflammation of the organs and parts just enumerated, and not infrequently with chronic disease of one, or of both ears, producing offensive discharge, perforation of the tympanum, and caries of the bones of the ear. *Chronic otitis* following scarlatina is generally of long continuance, sometimes occasioning caries of the mastoid cells and process; and even more extensive disease of the temporal bone. In some cases the disease extends to the membranes and sinuses of the brain, and even to the brain itself, as shown at another place (see art. Brain, §§ 58, *et seq.*); but these results seldom supervene until after several months, or even years.

59. IV. State of the Blood in Scarlet Fever.—Notwithstanding the chemical analyses, which have been made in Germany and France, of the blood taken from the subjects of scarlet fever, it is doubtful if any real or useful progress has actually been made in this department of pathological research during the last century and a half. The analyses, especially as regards this fever, have been few, and the results, in connection with the visible appearances and physical states of the blood, and with the stages and state of the disease, have not been stated with the least degree of precision. As regards the appearances and physical states of the blood, it may be remarked, that these depend upon the type of the fever, or the states of vital power and vascular action, and vary most remarkably with these states, as observed in other fevers and maladies attended by contamination of the circulation, and as described in the articles Blood (§§ 115. *et seq.*), Fever (§§ 93. 110. 520.), and Puerperal Fevers (§§ 215. *et seq.*). It is chiefly in the more inflammatory types of scarlet fever that blood has been taken and its appearance observed. In the more malignant forms blood has rarely been taken from a vein, and on the few occasions on which this has been done, it has presented similar characters to those stated above (§§ 43, 56.), and to those mentioned in connection

with the fevers just referred to, and in the article BLOOD (§§ 78, *et seq.*). ANDRAL and GAVARRET analysed the blood of three persons in scarlet fever, and LECANU in two cases; but the results which these analyses furnish are not materially different from those obtained from the analysis of the blood of a healthy person. It is chiefly in the more malignant, or putro-adynamic type, and in the advanced course of the malady, that the blood presents morbid appearances such as are stated in the articles referred to; but in these circumstances it has not been chemically examined.

60. V. THE URINE.—The *urine* in scarlet fever presents the most important changes as respects the pathological states characterising the several stages of the disease, and as regards the treatment of these states. These changes are various, not only in different cases, but also in the same case at different periods, and even in the course of a few hours, and hence have arisen the opposite or varying statements respecting this excretion which have hitherto appeared. The appearances and constitution of this fluid, moreover, have been very imperfectly investigated during the early stages of the malady; and the symptoms connected with the kidneys at these periods very insufficiently investigated, if not entirely overlooked, by most observers and writers on this disease.

61. The *urine* is always paler in children than in adults, and hence the deep colour of it in the former should attract more particular attention when observed in them — the most frequent subjects of scarlatina. — (*a.*) The urine at the commencement, and *during the early stages* of scarlatina is always scanty and very high-coloured, and often of a deep-red hue when there is much fever. It generally has an acid re-action in the *mild* and *inflammatory* or *sthenic forms* of the disease. In the *septic* or *asthenic types*, and especially when the affection of the throat or the eruption presents malignant characters, the urine is either neutral or alkaline and very turbid; sometimes it contains blood-globules; and is always very scanty, although in these, as well as in the more sthenic forms, it is voided frequently, or is attended by dysuria or scalding. In most instances, even very early in the disease, it rapidly becomes ammoniacal; but, in the more malignant states, it deposits a viscid whitish sediment at an early period, consisting of the earthy phosphates and mucus, and it contains urate of ammonia and uric acid. When the urine is of a dark-brown colour and turbid, or deposits a loose sediment of this hue, the presence of partially decomposed blood-globules in it may be inferred. Albumen is also sometimes present in the early stages, but in various or slight quantity; and it may be detected, or even be considerable, at one period, and not be found some hours afterwards, and yet be soon again present.

62. (*b.*) During the *advanced stages* of the mild and more *sthenic forms* of scarlatina, the urine becomes more abundant, of greater specific gravity from the abundance of saline matters, and presents the characters usually observed during the decline of inflammatory and continued fevers. In asthenic, septic or *malignant cases*, the urine becomes, with the progress of the malady, of a dark brown or yellowish colour, is very scanty, and of a specific gravity varying from 1020 to 1025. It has an alkaline reaction, with a disagreeable ammoniacal odour, and it occasionally contains blood and mucus, or partially dissolved hæmato-globulin, either diffused or in flocculent deposits, but rarely any or much albumen. It throws down a dirty white sediment consisting of earthy phosphates, urate of ammonia, urate of soda and mucus, with other animal matters. In these cases particularly, and less rapidly in others, the urine becomes more decidedly ammoniacal and offensive.

63. (*c.*) When the disease is *complicated in the early stages* or in its *advanced progress*, the urine is even still more changed from the natural state than above stated. If the attack be malignant or complicated from the commencement, and more especially if there be coma, or signs of inflammation of the lungs, pleura, or other internal organ or surface, with or without effusion, or external œdema, or if these complications occur in the *latent* and *non-eruptive* forms of the disease, the urine will be either *bloody*, or *albuminous*, and scanty, or it will be found to have been for some time previously either altogether *suppressed* or remarkably scanty, and high-coloured or bloody. Sometimes it appears like to the washings of meat, and is voided either frequently or involuntarily; and in others *hæmaturia* is decidedly present. In some cases urine has not been passed for many hours, and yet little or none has appeared to be retained in the bladder, indicating an arrest of the secreting function, owing either to suspension of the organic nervous influence of the kidneys, or to extreme congestion, or to both. In these cases, aching in the loins and lower limbs, nausea and vomiting, with general turgescence or œdema, headache, &c. may, or may not be present, with one or more of the complications described above (§§ 27. *et seq.*); but the pain and aching of the loins and limbs are not so great as usually observed in acute suppurative nephritis, although sufficiently indicative of suspended function and congestion of the kidneys, especially when viewed in connection with the state of the urine and the sympathetic phenomena. The connection of the renal affection, of the morbid and deficient urine, of the states of the blood and of vascular action, and of the consecutive inflammatory irritation, serous effusion, &c. with each other, and even the usual procession of these diseased states, in the course of scarlet fever, will be more readily understood, by a due and practical consideration of this topic, and of what I have already said respecting it (§§ 28. 41.).

64. (*d.*) During *desquamation* the urine generally contains albumen. SIMON remarks, that observations regarding the presence of albumen during this period are so contradictory as to render it a matter of interest to have the matter settled by further researches. "We have dropsical symptoms with albuminaria, dropsical symptoms without albuminaria, and albuminaria without dropsical symptoms. SOLON found albumen in the urine in twenty-two out of twenty-three cases of scarlatina. On the other hand, PHILIPP observed in Berlin at least sixty cases in which albumen was not detected."

65. In most cases, the urine is of a straw-colour in this stage, contains mucus-corpuscles, and is turbid owing to this circumstance, and to the quantity of epithelium, either in single scales, or in fragments of a connected series of scales, swimming in it. The sediment contains much

epithelium, occasionally formed by lymph into cylindrical fibrinous casts of the tubes, and crystals of lithic acid. These changes arise from the desquamation of the uriniferous tubes, and are sometimes antecedent to the desquamation of the cuticle. This early desquamation of these tubes furnishes a proof of the earlier and more constant affection of the kidneys than has hitherto been supposed; and is evidence of the important part performed by the pathological conditions of these organs at the commencement of the malady for which I have contended (§§ 28. *et seq.*). In favourable circumstances no albumen is found in the urine, in most cases, during desquamation and convalescence, or the quantity is slight. But it is found in small or moderate quantity, in a few instances, without either inflammation or œdema or dropsy in any form being present. In some of these a slight febricula is observed, and soon passes off without either of these results. When, however, dropsy or inflammation follows scarlatina, the urine becomes albuminous generally with, or previously to, the febrile symptoms ushering in, during convalescence (§§ 49.), the dropsy or inflammatory affection, and continues to present this state, more or less manifestly, during the persistence of these sequelæ. It is often most remarkable in those cases of dropsy or inflammation which are consequent upon the latent and non-eruptive forms of the disease; and is sometimes further attended by disease of the glands of the neck. When the urine becomes very albuminous during desquamation and convalescence, then acute febrile symptoms, and inflammation of some internal organ or part, or dropsical effusion, or both, either pathological state preceding the other, soon supervene, and rapidly assume a severe or dangerous form. The urine during this stage often contains an increased quantity of the animal extractive matters usually existing in this excretion.

66. VI. APPEARANCES AFTER DEATH.—These differ remarkably, according as this issue takes place at an early or an advanced stage, and more especially according to the nature of the local affections complicating or following the disease.—In the malignant form, decomposition follows dissolution sometimes with remarkable rapidity.—*A.* When death occurs at an *early period*, (*a.*) the *surfaces* of the body appears either of a livid or of a violet-coloured hue, generally in patches, when the eruption was present; but not infrequently all traces of the exanthem have disappeared. Upon dividing the integuments, the vascular rete is usually found more than commonly injected, and the subjacent cellular tissue is less turgid than during life.—(*b.*) Generally also the redness of the *mouth* and *pharynx* disappear after death. The *tonsils* present different states according to the prevailing type of the disease. They are frequently enlarged, softened, pultaceous, or gangrenous; and sometimes they are covered by a soft membranous exudation. The mucous surface of the *pharynx* and *œsophagus* is considerably softened, and that of the former is occasionally ulcerated, softening and infiltration of the adjoining parts being manifest. The *palate* sometimes is partially destroyed by sphacelating, or septic ulceration, especially when the tonsils are gangrenous, or the pharynx ulcerated and softened.—(*c.*) The *digestive mucous surface* varies with the character of the fever. In the more asthenic or malignant cases, it is softened, discoloured, and readily detached. Generally BRUNNER's glands are more developed than natural, and the agminated glands of PEYER more tumid. The *mesenteric glands* are only occasionally enlarged and more vascular. The *spleen* is frequently enlarged, softened and friable; sometimes it is almost pultaceous. The *liver* and *lungs* are often more or less congested; and the *blood* found in the auricles of the heart and veins is dark, semi-fluid or grumous; and, in the malignant cases especially, this state of the blood is still more remarkable. The bronchial mucous membrane is injected with dark blood, and the *bronchi* often contain some mucus.—(*d.*) The *kidneys* are always congested, tumid, and often of a dark mottled hue externally; whilst an increased vascularity, varying in degree, in the different structures, is found at this period of the disease, upon dividing the organ longitudinally. The urinary *bladder* is commonly contracted, and contains little or no urine.

67. *B.* When scarlatina presents any of the *primary complications*, or prominent affections mentioned above (§§ 27. *et seq.*), during the second stage especially, the appearances are very different from those just stated; for, whilst those exist more or less manifestly, others are superadded.—(*a*) If the patient have been the subject of cerebral complications, the *membranes*, and even the *substance of the brain*, present increased vascularity, with some serous effusion between the membranes, especially at the base of the brain, and in the ventricles, particularly in those cases in which the urine has been very scanty or suppressed.—(*b.*) When the patient has been suddenly destroyed by the extension of the pharyngeal disease to the epiglottis, *larynx* and *trachea*, considerable œdema of the glottis, between the chordæ vocales, &c., and general tumefaction of these parts, sometimes with the effusion of a dirty friable lymph upon the surface, partially detached, or but slightly adherent, and occasionally spreading down a portion of the trachea, are observed. This state of parts was seen by me, at an early period of my practice, in a man, aged about 60, who died of scarlatina with sore throat in twenty-four hours from the commencement of the disease, owing to the extension of the local affection to the larynx. In these cases the *lungs* are always found remarkably congested with black fluid blood, and the surfaces of the *bronchi* are dark or livid, and injected, the tubes often containing a bloody mucus.—(*c*) When the *parotids* are much enlarged, and the neck tumid, and the surrounding *cellular tissue* is the seat of asthenic or spreading inflammation, then these glands, and generally the lymphatic *glands*, are found enlarged, injected, and softened, and the adjoining cellular tissue is infiltrated with a sanguineous serum, or lymph, or puriform matter; each of three several kinds of morbid effusion predominating in different parts of the neck in the same case. If the patient have lived a few days, the morbid fluids infiltrating the cellular tissue have sometimes contaminated, and ultimately destroyed the vitality of this tissue; until the sphacelation which results has left the muscles and vessels of the neck almost as if dissected, and has even spread to the sternum. In a case to which I was called, the gangrene advanced as far as the pectoral muscles; but death generally takes place before disorganization proceeds so far as this. The changes observed in the *ear* and its

vicinity have been already noticed (§§ 32. 46.); but these are chiefly of the nature of spreading inflammation along the Eustachian tube to the internal ear, and sometimes also to the mastoid cells, cochlea and semicircular canals, and are occasionally remotely followed by disease of the bone containing these parts.

68. (*d.*) When *pneumonia* complicates the disease both lungs are generally affected, although in different degrees, and the appearances vary somewhat with the type of the fever. Most frequently the lungs present in various grades, in different parts, but most remarkably in the posterior aspect, congestion with effusion of a serous or fluid lymph, or with a more firm lymph in some places, giving rise to varied grades of splenization, death or recovery taking place before the change can proceed further. The *pleura* is frequently either decidedly inflamed, or contains fluid with or without manifest inflammatory changes; and often in connection with pulmonic congestion or inflammation. In the more sthenic forms of the disease, lymph, in some instances, is exuded, with or without, most frequently with, serous effusion, and sometimes with adhesion of the opposite surfaces by bands of fibrinous lymph, or more continuously. —(*e.*) In the asthenic or malignant states, the marks of inflammation are less obvious, but the effusion into the pleural cavities is greater; and similar changes are sometimes observed also in the *pericardium*.—(*f.*) Inflammatory appearances, generally with a turbid serous effusion, and occasionally with slight or partial adhesions, are sometimes found in the *peritoneum*.—(*g.*) The synovial membrane of the *joints*, in a few instances, has presented marks of inflammatory action, with more or less effusion into its cavity.

69. *C.* When death occurs during desquamation or subsequently, owing to either of the *sequelæ* — or secondary complications — noticed above (§§ 41. *et seq.*), the appearances differ but little from those just mentioned, with reference to their respective affections; excepting that they either consist, in great measure, of dropsical effusion of greater or less extent and amount, or are associated with other lesions of an inflammatory, congestive, diffusive, or of a mixed kind.—(*a.*) The most frequent changes exist in the *kidneys* and in the shut *cavities* and *cellular tissue*, in the form of effusion, often with inflammatory appearances. The *kidneys*, in the more rapidly fatal cases, and in those which occur at an early period of desquamation, are frequently injected, or congested, mottled or marbled externally; and, internally, the constituent tissues present various appearances, certain of them being very vascular, others pale or anæmic. Hence the substance of the organ often is mottled, and generally not much increased in bulk, unless when the congestion and vascularity predominate. On examination by the microscope, the Malpighian bodies are often seen to be pale, and the surrounding capillaries injected, whilst the tubuli are filled with epithelium cells or scales. In those cases, in which dropsy occurs later in the course of recovery, and which are of longer duration, the *kidneys* generally present somewhat different appearances, which more nearly approach those observed and described in the articles DROPSY (§ 13.), and KIDNEY (§§ 23. *et seq.*), when treating of the changes connected with *albuminuria*. Although the surfaces of the organs are sometimes mottled, and more or less congested, their structures, on division, are pale, especially in spots, as if anæmic, or from the deposition of lymph or albumen, and approach the characters of granular degeneration. The Malpighian bodies and the surrounding capillaries appear pale and bloodless under the microscope, and the tubuli are filled, in various places, with epithelium cells, and in others with what appears to be a mixture of albuminous matter or lymph, and oil-globules, or of these with detached epithelium.*—(*b.*) As respects the *cellular*

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* After this article was sent to, and whilst it was passing through the press, Dr. G. JOHNSON's very excellent article on the kidney, in the *Cyclopædia of Anatomy and Physiology* (Art. *Rex*), was brought to my notice, as well as his valuable paper in the Transactions of the Medico-Chirurgical Society (vol. xxx.), in both which places the morbid anatomy of the kidneys after scarlatina is ably described. Dr. G. JOHNSON, who was the first to detect oil or fat in the kidneys, in granular disease of these organs, states that he has not found oil in the urinary tubes after scarlatina. I observed some oil-globules in two cases of a more than usually chronic duration, as stated above; but Dr. JOHNSON, who has examined more of these cases than I have, without meeting with this change, justly considers the scarlatinal affection of the kidneys as very distinct from the granular disease of the kidneys described by Dr. BRIGHT; and whilst he denominates the former "*acute desquamative nephritis*," he terms the latter "*fatty degeneration of the kidneys*." I believe that the more acute or rapidly fatal cases of dropsy or inflammation after scarlet fever rarely present any oil-globules in the urinary tubes; but that, when the scarlatinal nephritis becomes chronic, and is followed by change of structure, then oil-globules are found in the tubes. In one of the cases in which I observed them after scarlatina, the man who was its subject was between 30 and 40 years of age, and was probably irregular in his habits; the consequent anasarca having been of considerable duration.

"*Acute desquamative nephritis*," of Dr. G. JOHNSON, occurs frequently as a consequence of scarlatina, and is occasionally produced by other animal poisons, as that of typhus fever, small pox, or measles. I have noticed, in the article KIDNEYS (§ 56. *et seq.*), the connection of this form of nephritis, which I have named "*consecutive, or secondary asthenic nephritis*," with febrile and other diseases, and the various circumstances of this connection. In relation to scarlatina, I have contended above that it occurs either *primarily* or *secondarily*; and that often there is thus a "*primary scarlatinal nephritis*," and a "*secondary scarlatinal nephritis*," (see also art. KIDNEYS, § 56.), or inflammation of these organs either associated with the scarlatinal fever, or occurring as a consequence of this fever. Dr. G. JOHNSON describes the nephritis *consequent upon scarlatina* as follows: — "The kidney in these cases is enlarged, apparently by the deposit of a white material in the cortical substance; the vessels in the cortical portion where they are not compressed by this new material, are injected, and of a bright red hue; the medullary cones are of a dark red colour, in consequence of the large veins which occupy these portions of the gland being distended with blood. The appearance of the entire organ is quite that of a part in a state of acute inflammation.

"When the kidney has been in a softened condition before the occurrence of the inflammatory disease, as often happens in elderly persons, the lobules on the surface appear larger and coarser than natural; the veins being less compressed than when the natural texture of the kidney is firmer and more unyielding, are much distended with blood, so that the entire organ is of a dark slate colour.

"On a microscopical examination the convoluted tubes are seen filled, in different degrees, with nucleated cells, differing in no essential character from those which line the tubes of the healthy gland. The Malpighian bodies are for the most part transparent and healthy, but the vessels of the tuft are sometimes rendered opaque by an accumulation of small cells on their surface. Some of the tubes contain blood, which has doubtless escaped from the gorged Malpighian vessels. There is no deposit exterior to the tubes.

"The condition of the urine in these cases is clearly indicative of the process going on in the kidney. After it has been allowed to stand for a short time, a sediment forms; and on placing a portion of this under the microscope, there may be seen blood-corpuscles, with epithelial cells in great numbers, partly free and partly entangled in cylindrical fibrinous casts of the urinary tubes, and

tissue and the *serous cavities*, it need only be added, that the former is generally more or less loaded with serum, the latter sometimes contain effused fluid with, or without, slight or marked inflammatory appearances, although these latter are not so frequent or so marked as in the primary complications noticed above (§§ 27. *et seq.*). The effusion, as well as inflammatory changes, may exist only in one of the cavities, or may extend to two or more. Both pleural cavities are generally implicated, but sometimes in different degrees; and the *parotid* and *lymphatic glands* are often enlarged, and the *joints* occasionally inflamed.—(*c.*) I have likewise seen the *vertebræ* of the neck, their ligaments and intervertebral substance seriously affected, caries of the former with chronic inflammation, thickening, &c. of the theca supervening and occasioning cervical paraplegia or general palsy (§ 47.).

70. VII. DIAGNOSIS.—Scarlatina can be confounded only with measles (*Morbilli*), or with the mixed or hybrid disease which I have described by the name of *Rubeola*.—*A.* Dr. R. WILLIAMS has stated that the earlier appearance of scarlatina after exposure to infection, and of the eruption after the primary fever, may serve to distinguish this disease from measles. But, although these circumstances frequently obtain, and may be viewed as the law, still the exceptions furnished by different epidemics and by individual cases are so numerous, that but slight importance should be attached to them. This will be still more apparent upon referring to what I have adduced respecting the periods of *latency* in these maladies in the article on INFECTION (§§ 31, 32.). The appearances of the efflorescence in both maladies, and the signs furnished by the inlets to the digestive and respiratory passages, and the states of the urinary functions are chiefly deserving attention in establishing a diagnosis between *scarlet fever* and *measles*. In the former, the tongue presents redness of the point and edges and strawberry surface, and the fauces more or less redness at an early period, whilst the tonsils are enlarged or soon afterwards are ulcerated. There is seldom, or very rarely, sneezing or coryza, both which usher in measles; and in the latter, the affection of the throat is either altogether absent or very slight, whilst cough is often severe. The *period* at which the *eruption* appears differs much with the constitution of the patient, the season, and character or type of the prevailing epidemic, as regards both maladies; and although deserving of mention as respects the description, cannot be depended on in the diagnosis. In scarlatina the patches are large, and the surface covered by them generally ample; but in measles the eruption consists of small circular dots like flea-bites, and when most confluent the patches or clusters are small. The colour of the rash is that of a vivid red in scarlatina, whilst it approaches a raspberry hue in measles. The former can hardly be mistaken for *roseola*, which is preceded by very little fever, and rarely by any affection of the throat; and the rose-coloured and irregular spots of which differ much from the large patches of scarlatina. In most cases, the eruption of scarlet fever is more general than that of other exanthematous diseases; whilst the fever is more persistent, and does not abate with the development of the eruption, and but slightly, or not at all, with the disappearance of it, but often continues many days, or even some weeks afterwards; or is sometimes considerably exacerbated after having abated. In measles, the fever usually subsides with the disappearance of the rash.

71. *B.* The *kidneys* are not nearly so liable to be affected in measles as in scarlet fever, in which they are remarkably disordered, both primarily and secondarily, and the urine is either partially or altogether suppressed or otherwise morbid. The infectious miasm of scarlatina has a special influence on the states of the kidneys, as shown above (§§ 28. *et seq.*), and thereby often induces several secondary affections not observed to follow, or very rarely, the other exanthematous fevers, more especially dropsies, diffusive or congestive inflammations with serous effusion, &c., affections of the joints, gangrenous erysipelas, &c.

72. *C.* The diagnosis of the *primary fever* of scarlatina is often difficult or impossible, if the anginous affection be absent, and if no eruption have appeared. The circumstance of the disease being in the same family, house, or immediate vicinity; the states of the tongue, throat, flexures of the joints, and urinary excretion, and the character or type of the fever will sometimes aid the diagnosis; although the severity of the disease, the affection of the head, the convulsions or delirium, the vomitings and thirst may lead to the belief that the first stage of meningitis is actually present. In most cases, however, of this period of scarlatina, the severity of the vomiting; the pains in the back and loins; the remarkable scantiness and morbid appearances of the urine; the burning heat and dryness of the skin; the enlargement of the parotids, or the existence of some complication; the great rapidity of the pulse, and the acuteness of the attack, should induce suspicions of scarlatina, especially in the circumstances just mentioned, although neither eruption nor throat-affection is present (see above § 4., and art. MEASLES, § 48.).

73. VIII. PROGNOSIS, &c.—It has been attempted by some writers to impart an *ad captandum* precision to the prognosis of scarlet fever that the subject does not admit of, by calculating the proportion of deaths in this disease. But it is obvious that the rate of mortality will vary with the several forms, types, complications, &c.; with the combinations of predisposing causes, and with the treatment.—*A.* In the simple, mild, and more sthenic types of the malady, the prognosis is favourable, although the contingency of secondary disease should be taken into account, yet this may be generally guarded against and prevented. When the malady is complicated, irregular, malignant or asthenic, then the danger is considerable, although numerous circumstances may indicate either a diminished or an increased risk. It is chiefly from the existence of certain *symptoms* that danger is to be inferred; but there are *circumstances* connected with the pre-existing state of the patient which often increases the risk, as the first period of *dentition*, the period of *weaning*, the *cachexia* produced by unwholesome or insufficient food; a bloated,

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very commonly numerous crystals of lithic acid are present.

"As the disease subsides, which under proper treatment it usually does in a few days, the blood, fibrinous casts, and epithelial cells diminish in quantity, and finally disappear; but traces of the casts may be seen some days after the urine has ceased to coagulate, on the application of heat or nitric acid."—(*Cyclop. of Anat. and Physiol.* art. *Ren.*)

leucophlegmatic or plethoric habit of body, and the *pregnant* and *puerperal states*. In some epidemic visitations, and in some seasons, more than in others, pregnant and especially puerperal females are liable to be attacked by scarlatina; but the liability is not so great as the danger to those who are infected; for the *pregnant* are prone to abortion, and when this occurs the disease often assumes a most dangerous form; and if the disease occurs soon after *parturition*, recovery rarely takes place, more especially as observed in some epidemics. In these latter circumstances the scarlatina often assumes the appearances of, and can hardly be distinguished from, the most malignant form of puerperal fever. Scarlatina thus occurring soon after *parturition* has been described as follows by MALFATTI. — "It usually attacked patients immediately after delivery, and caused the utmost prostration of strength, and slight pain in the throat. The eruption assumed either the miliform or levigated character, and was of a dark violet hue. The strength of the patient now sank rapidly, and to a burning heat succeeded coldness of the extremities, and a very frequent and small pulse. To these symptoms were added great anxiety, hæmorrhage from the nose, and a fœtid and copious lochia." He adds, that the infected, in this state, all died, "qualiscumque adhibita fuerat medela."

74. *B.* The *symptoms* which more especially indicate danger are the occurrences of convulsions at or soon after the attack, or of delirium on the first and second day. In these cases the child often dies, as remarked by Dr. R. WILLIAMS, on the third or fourth day, and the adult on the eighth or tenth; but this issue sometimes in these takes place even earlier, more rarely later. A severe affection, or sphacelating or foul ulcerating state, of the fauces and tonsils; a brown state of the tongue, or a clean, raw tongue, or a glossy state of the tongue or throat, with a rapid fluttering pulse, are very unfavourable symptoms; as also is a sudden fading of the eruption, or the changing of it to a livid hue; or the appearance of petechiæ or of purple spots. The supervention of coma, or of pericarditis, or of double pneumonia, or pleuritis, or peritonitis, is unfavourable, but not necessarily fatal; but the danger of these, as well as of all the other primary and secondary complications of the malady, is remarkably heightened by suppression of *urine*, or by a very scanty or bloody state of this excretion, and by other indications of serious affection of the *kidneys*. Persistent vomiting, a severe or obstinate diarrhœa; acrid or excoriating discharges from the mouth, throat, and nostrils, with or without hæmorrhages; hæmaturia, or melæna; the association of two or more of the complications or local affections already described, especially in a severe form; the appearance of diffusive inflammation of the cellular tissue in the vicinity of the parotids, and extending down the neck, or of extensive abscesses, or sphacelation, in this situation, are very unfavourable occurrences. The same may be said of affections of the joints, erysipelas or local gangrene, and affection of the cervical portion of the spine, with consecutive caries of one or more cervical vertebræ. But these are not necessarily fatal, although very dangerous; even from the last of these lesions, recovery may take place, a result which was obtained in two cases which were under my care, both of which are now alive and quite well, excepting a stiff and shortened neck.

75. *C. Dropsy*, in the form of anasarca, or taking place in any of the cavities, in connection with scarlatina, varies much in danger, with the season and the prevailing epidemic, with the seat of effusion, with the nature of other associated morbid states, and more especially with the states of the kidneys and urinary excretion. The occurrence of anasarca *during the eruption*, or of effusion in any shut cavity, at this period, with or without inflammation, is an indication of danger, more especially if the urine be very scanty, very deep-coloured, or suppressed. Anasarca occurring alone *during desquamation or convalescence*, although the urine is albuminous is generally cured, if no further complication take place, and if the urine is not very scanty, or very albuminous, or bloody. But if the urine assume either of these states in a remarkable degree, the supervention of most dangerous internal effusion or inflammation, chiefly of the meninges of the brain, of the pleura, pericardium, or peritoneum, or of the lungs, &c., may be expected. The danger and the frequency of these secondary complications of scarlatina, as well as of the primary associations, vary much in different epidemics, and with the numerous causes or occasions concurring to render the infection intense, or to reinforce the operation of the poisonous miasm, and with those more especially which are about to be mentioned (§§ 84. *et seq.*).

76. IX. CAUSES. — i. THE SPECIFIC CAUSE, OR POISON. — *A.* Scarlet fever is *caused* by a *miasm* or *emanation* from a person already the subject of this disease; but the exact and intimate nature of the miasm, and the origin of it, are unknown; we know only the effects or phenomena which this cause produces, and most of the circumstances which favour its operation; and we further know, that, however these effects vary in severity, in form or in character, they are always of a specific nature; the seminium attending them multiplying and disseminating itself, and spreading its kind, whenever circumstances favour the propagation. Upon these circumstances, the prevalence of the malady chiefly depend; for they favour the operation of the specific poison or infectious miasm which produces it,—1st, by predisposing the system of individuals to the invasion of this miasm,—2dly, by concentrating and increasing the dose or quantity of the poisonous emanation invading the frame. During many ages, and especially when the earlier accounts of the malady were furnished, either the combinations of these predisposing circumstances were greater at distant intervals, or their absence was more complete in these intervals than at the present day, or the infectious or poisonous miasm was entirely absent, or remained latent or concealed, for prolonged periods. Either of these conditions may have existed; or the infection, having produced its effects on all who had come within its sphere, had ceased to spread, and had ultimately disappeared from a place for a longer or shorter period, until it was introduced by a poisoned or infected person, or by contaminated articles or fomites. This latter circumstance—this re-appearance of the malady in a place long entirely exempt from it, suggests the following questions as to its origin,—1st, Whether the disease is caused only by a specific seminium

which had originated at some unknown period, and, having infected one and more persons, and subsequently all who were predisposed to the infection, had then ceased to produce its effects, but was retained by substances capable of preserving it under certain favourable circumstances, until it was again brought to act on those predisposed to its influence? — 2dly, Whether the disease is always thus perpetuated by the preservation of the infectious seminium by individual, or rare, or scattered cases, and by fomites; or is it produced, *de novo*, by the combination of those causes, in an intense form, which are usually viewed as concurrent and predisposing causes, and, being thus produced anew, is then propagated by the infectious emanation proceeding from those thus attacked?

77. I incline to the first of these opinions, because we have no sufficient evidence of the reproduction of this malady by the combination of the causes usually favouring it, predisposing to it, and rendering attacks of it malignant or complicated, and because an infectious seminium, as in the case of small-pox, may be preserved, propagated, and become epidemic — may almost disappear for a time, and then unexpectedly break out — without the means of its preservation, the sources of its infection, or the causes of its prevalence, and of its multiplied effects, being made manifest, or even admitting of solution, on many occasions. But the difficulty of tracing infection to its sources on all occasions, in this and in other infectious maladies, is by no means an argument against its existence; for causes are often inferred from their effects with greater certainty than from some other proofs upon which firmer reliance is often placed. The laws of infection, and the numerous circumstances connected with the sources, the preservation and the dissemination of infectious seminia, admit not of a rational doubt of the perpetuation of these seminia, although their effects may be sparingly or rarely disseminated, or even developed after long intervals. Indeed much of what is known of these favours a firm belief in this source of scarlatina, as well as of measles and small-pox, on all occasions and in all instances. We know that the vitality of several kinds of seed may be preserved for many ages; and why should not the poisonous properties of an animal fluid or miasm be preserved for months, or even for years, when exclusion from the air and other circumstances favour the preservation? Admitting this, allowing also that the seminium often requires many days to take root and to develope itself into full efflorescence, knowing, moreover, the diversified media by which the morbid or poisonous emanation may be preserved, conveyed, and brought even into unrecognisable operation, it cannot be a matter of surprise that the source of infection frequently admits not of demonstration. Two powerful circumstances in favour of the existence and operation of a specific infection or poison have too frequently been kept out of view, namely, — 1st, the non-existence, or non-appearance, at any time of this disease in several secluded or isolated localities and islands, although the several causes tending to favour the dissemination and malignancy of the disease — those very causes which have been belived by some to be capable of originating the malady *de novo* — have been there present, in the most pregnant forms of union and association, — and, 2dly, the fact that, when the disease has made its appearance in such places, it has always been traced to the introduction of infection, and, having exhausted itself on all the predisposed to it, has entirely ceased and disappeared for years, until again introduced by the infected or by fomites.

78. If we refer to what is known (and our knowledge in this and in other allied topics is very imperfect) respecting the statistics of disease in most of our cities and large towns, we shall find, that at no time are cases of scarlatina altogether absent. I believe, moreover, that cases often occur which are either not recognised at all, or not as cases of this disease. Hence sources of infection are rarely absent from these localities, irrespective of the chances of transport to, and transmission from them, or, if absent for some time in one place, they are present in other places, from which they are transmitted to those which have been for a longer or shorter time exempt from them, and which, from this circumstance, furnish subjects predisposed to infection.

79. *B.* The *media* by which this disease is transmitted from those affected to the healthy, are generally the atmosphere surrounding the sick, and substances which imbibe the miasms emanating from those who are, or have been, recently attacked, and which retain it for a time, but soon impart it to the air — *fomites* (see art. INFECTION, §§ 16, 17.). It has not been demonstrated, nor indeed does the matter readily admit of precise demonstration, how far the miasm of scarlatina may extend, by means of the atmosphere, from a person sick of the disease. Much will depend upon the state of the air as to humidity, motion, &c., and upon the predisposition of those exposed to it. It has been supposed, that the appropriation of a room in schools for such children as may be seized with either scarlatina or measles may prevent the spread of the disease among the healthy. This has been attempted in many instances; and by myself, in respect of these diseases on several occasions, and on two occasions with complete success, in others with partial but very considerable success. Much depends upon the size and construction of the building, and the strictness of the seclusion and of the precautions as to fomites. This measure failed in Heriot's Hospital, Ackworth School, and the London Foundling Hospital, where the buildings furnished excellent means of isolating the infected. But I suspect that the precautions taken failed in preventing the transmission of the infecting miasm by persons or clothes. Besides, when a school is large, some of its inmates may have been so long the subjects of the eruptive fever before the disease is recognised, as to have infected others previously to their removal. When the building furnishes the means of complete isolation, the attempt at thus preventing the spread of the disease should be made; for it is better that the infected should receive due attention in such circumstances at the place of infection, than that they should be returned to their friends, where they may transmit the disease to many others; and it is even better that those in the infected school, who have not yet sickened, should not be allowed to leave it, inasmuch as they may convey the disease in their persons or clothes to the families to which they would return.

80. *C. Fomites*, or substances impregnated with the miasm exhaled by persons sick of scarlatina, are

frequent media by which this disease may be transmitted to the healthy, either in the vicinity of the sick, or in places at a great distance. The *duration* of the period in which the capability of infection is possessed by fomites is uncertain, and it has not been ascertained. It may be inferred to be very short when the impregnated substances have been exposed to a free current of air; and much longer when they have been shut up and entirely prevented from imparting or losing the retained miasm. Feather beds and woollen bed-clothes retain the infection for the longest period, especially when undisturbed or shut closely up. The duration of the power of infection, in respect of these articles and of woollen body-clothes, has not been and is not likely to be determined; for various circumstances will either shorten or prolong the period. Dr. SIMS remarks "that the infection seemed to remain in a house some, but not many weeks, after all the family were recovered." In large airy houses, where ventilation and means of purification are adopted, a very few weeks may be considered sufficient to remove the infectious property; especially if the beds and bedding are subjected to a high range of temperature, as advised in the article on *the prevention of* PESTILENCE (§ 77.). But, where these means are neglected, and in close, dirty, and low apartments and houses, and in crowded localities and houses, where the beds, bed-clothes, hangings, &c. are foul, and insufficiently aired, the power of retaining and transmitting infection may exist for several, if not for many weeks. When fomites are shut up, and excluded from imparting the retained miasm, the disease may be thereby conveyed to distant or remote parts, and even without the source of infection or the media of transmission either being recognised or admitting of recognition.

81. *D.* The propagation of the disease by *inoculation*, and by the contact of the morbid secretions of the disease, has been demonstrated. Sir B. HARWOOD and others have tried to inoculate healthy children with the fluid from vesicles sometimes intermingled with the eruption of scarlatina, in hopes of producing a milder disease, as in small-pox; but, although the disease was thus communicated in many instances, no mitigation of its type was thereby obtained. In a case which came under my care, the disease was produced by the contact of a small portion of the discharge from the throat of a person with malignant anginous scarlatina, and the patient thus infected had the disease in the most severe form, and recovered with difficulty.

82. *E. The susceptibility* to the infection or contagion of scarlatina is exhausted or annihilated after the disease has run its course — after the scarlatinal poison has produced its specific effects. This law obtains as remarkably in respect of scarlatina as of small-pox. The impossibility of being infected by this malady a second time has been fully ascertained by Dr. WILLAN and many others; but a very few exceptions to the law have been recorded,—so few as not to amount to more than one instance amongst two or three thousands constituting the law. This immunity from a second attack may be viewed as a proof that the disease is not merely one of the blood alone, but is also, if not chiefly, one primarily affecting and changing the susceptibility of the organic nervous system, the blood being altered by the state of this system, on the conditions of which this fluid is so intimately dependent.

83. *F. The coëxistence* of scarlatina with measles, with the vaccine disease, with erysipelas, and with small-pox, has been contended for by some, and denied by others. I believe in its coëxistence with measles, and in the production in consequence of the hybrid disease described under RUBEOLA; and its coëxistence with the other eruptive maladies just mentioned, especially vaccinia, is not unlikely to occur under circumstances favouring the operation of their respective poisons upon the frame at the same time. Dr. GREGORY states that he has seen at the Small-pox Hospital "several unequivocal cases of the simultaneous existence of small-pox and scarlatina anginosa." And Mr. MARSON, surgeon to that hospital, remarks that, in the course of eleven years, "he has seen seven persons who had variola and scarlatina simultaneously."—(*Med. Chir. Transact.* vol. xxx. p. 121.)

84. ii. PREDISPOSING CAUSES OR CIRCUMSTANCES.—*The causes predisposing to the infection of scarlet fever* are numerous, and may be referred to the *states of individuals* exposed to infection, and to the circumstances or *conditions favouring the concentration* and the invasion or operation of the poisonous miasm.—*A.* As the *mode* in which this disease is generally infected, whether the infectious emanation proceeds directly from the sick or mediately or by means of fomites, is by the inspiration of air contaminated more or less with the poisonous miasm, which affects, nearly at the same time, or in quick succession, the organic nerves of the respiratory surfaces and the blood distributed to these surfaces — morbidly impressing the former, and passing by endosmose through the latter — it follows that the susceptibility to infection must depend much upon the states of the organic nervous power, and of the vascular system, and that, when the energy of the one is impaired, and the action of the other is lowered, the frame will be more liable to be invaded by the poisonous influence. Hence some individuals are more prone to infection than others, and hence the same person is more predisposed at one time than at another, according to the varying states of nervous tone and vascular action. The conditions of the atmosphere, as powerfully modifying these states, have considerable influence in predisposing to infection; but to this and to the immediately preceding topic, I can add nothing to what I have stated in the article on INFECTION (see §§ 44—55.).

85. *B.* There is no cause of predisposition more generally manifested than the *age of childhood*. The susceptibility of infection appears to be greatest from the period of weaning to fully adult age. After thirty or forty years of age the susceptibility is remarkably diminished; but although I have seen several cases from thirty-five to fifty years of age, I have met with one only between fifty and sixty, and he died in twenty-four hours owing to the extension of the disease to the larynx. As the susceptibility of infection is greatest in childhood, and as the proportion of those who have had the disease at this epoch is very great, it follows that the number of non-infected at adult and advanced age is comparatively small. Although cases of the disease at these ages are thus few, yet they are generally of a most severe character,

especially about and after forty years of age, as respects not merely the complications, but also the type of the eruptive fever, from its commencement, and the danger is thus increased with advanced years. According to my experience, the younger the child the milder is the attack; but there are numerous exceptions to this law arising out of the aggravating circumstances connected with weaning and dentition, and the numerous *concurring predisposing causes*, observed among the poor — of which the most influential are, ill-clothing; insufficient and unwholesome food; low, ill-ventilated and malarious abodes; exhalations from cess-pools, privies, and sewers, and inattention to cleanliness, with various others tending to lower the constitutional powers and the vital resistance to the invasion of infection, to concentrate the infectious emanation, and thereby to increase the dose of the poison.

86. Infants during the period of suckling very frequently escape the disease, although every other member of the family may be attacked. I have seen, on several occasions, every one of a family of eight or nine children affected in a very short period of each other, and the infant at the breast to escape. The cause of this *comparative immunity* is not very apparent. Probably infants at this period are less exposed to the infectious emanation; but this depends much upon the circumstances of families; amongst the poor the exposure is not materially less. It is rather to be imputed to a less susceptibility of infection at this period, depending probably upon the circumstance of the infant being then nourished by a secretion directly from the secreting organs of the mother, and thus possessing some measure of an invigorating vital emanation, thereby enabling the infant to resist the infection. I have observed, in many instances, that persons who have experienced a very severe attack of measles, have escaped the infection of scarlatina, although much exposed to it. This circumstance is deserving of further observation; but, from whatever cause, some persons resist this infection, although frequently exposed to it from an early age. Out of 2614 cases recorded by Mr. FARR in his fourth report, 2419 were children, 182 adults, and 13 aged persons. Scarlatina may attack the *fœtus in utero*. Instances of this have been furnished by several writers. Dr. GREGORY states that, "on the 28th of April, 1839, his youngest child was born, evidently suffering from fever. The throat was affected the following day, obviously from angina maligna. Eruption was never developed. The infant drooped and died on the first of May." (p. 146.)

87. *C.* Scarlet fever affects both *sexes* in equal proportions, and very remarkably so. In London it destroyed, in 1838, 747 males and 777 females; in 1839, 1241 males, and 1258 females; and throughout England and Wales, in 1840 (exclusive of the metropolis)*, 8927 males, and 8935 females. This disease appears to be most prevalent in temperate climates. It is stated to be comparatively rare in Bengal. Dr. GREGORY remarks that Dr. JACKSON, formerly of Calcutta, could not recal to mind any cases which he had seen in India deserving the name of scarlatina. I never met with a case within the tropics. I believe that the disease has not yet been imported into Australia, Van Diemen's Land, and New Zealand. It was brought to North America in 1735, and its progress was very slow, but very fatal. The epidemic in 1746 in that continent was most pestilential. "Villages were depopulated by it, and parents had to bewail the loss of all their children."

88. *D.* As to the *complete immunity* consequent upon an attack of this malady, it may be remarked that this is to be imputed to the exhaustion of susceptibility produced by this poison, as by several other animal poisons, as respects their several specific effects. That the poisonous emanation or material should fail of producing any effect upon a person who has, at some more or less remote period, been affected by it, is a most important law in this and other exanthematous and pestilential maladies, especially as respects the safety of the species. The protection thus obtained is the chief means of preventing the depopulation of

* The following will show the comparative prevalence, *in the metropolis*, of *scarlet fever*, *measles*, and *small-pox*, from 1838 to 1848, both years included — during the last eleven years. It must be manifest that the numbers assigned can be an approximation only to the true amount, as the causes of death are in many instances arbitrarily assigned in the returns; but they are sufficiently accurate to convey useful information.

Years.	Scarlet Fever.	Measles.	Small-pox.
1838	1524	588	3817
1839	2499	2036	634
1840	1954	1132	1235
1841	663	973	1053
1842	1224	1253	360
1843	1867	1412	438
1844	3029	1182	1804
1845	1085	2318	909
1846	928	747	257
1847	1433	1778	955
1848	4756	1143	1617
During eleven years,	20962	14632	13079

During the last eleven years the deaths, in the metropolis, from *scarlet fever* have been greater than from *measles*, or from *small-pox*, or from *hooping-cough*, or from *continued fever*. In only three of these years have the deaths by measles been greater than those by scarlatina; and in only two has the mortality from small-pox exceeded that of scarlet fever. In 1841 and 1846 the mortality of scarlatina and measles was low; and in the latter year that of small-pox was the lowest. In 1839, 1843, 1844, the mortality of both scarlet fever and measles was high. During 1848 the deaths from scarlatina were about three times greater than the average of the former years. The maximum mortality from measles occurred in 1845, and from small-pox in 1838.

The greatest number of deaths from scarlet fever occur among the poor owing to the circumstances, which both predispose to infection, and render the disease more malignant; and even those causes which develope the sequelæ of the disease and render them fatal (see § 42.) are also most prevalent in the lower classes. If the above amount do not comprise the deaths from dropsy, or other diseases consequent upon scarlatina, the mortality from this malady must have been greater than here stated. The above results will show that there are few diseases—perhaps none—from which the general amount of mortality, and of danger, is greater than in scarlet fever, and yet there is not one, of which the pathology and treatment has received less attention and elucidation in modern times than it.

The *proportion* of *malignant* to *mild* cases of scarlatina cannot be truly estimated, as it differs in different seasons, in different localities, and in different epidemic prevalences. Dr. WILLAN found it to be one of the former to four of the latter; and Dr. CLARK, one to two; and one of six had dropsy during convalescence. The *rate of mortality* must necessarily also differ with the above causes — the fluctuation sometimes observed being remarkable, — being from one in forty to one in six cases. Dr. GREGORY considers that the average mortality is about six per cent.; and that, while throughout England and Wales, 19,816 deaths occurred in 1840 (a year of average mortality for London) the total number of seizures must have amounted, according to this calculation, to about 330,266 in that year, for the whole of England.

districts where any of these maladies break out; and accordingly it has been observed, that where scarlet fever, or measles, or small-pox has been introduced for the first time, or after the lapse of very many years, the whole, or a large proportion of the population being susceptible of infection, the destruction of human life has been there most terrific. That the immunity obtained, by an attack of those diseases which infect the constitution only once, cannot be imputed to any change in the blood consequent upon such an infection, may be inferred,—1st, from the impossibility of a permanent change in this fluid that could prevent the recurrence of any alteration in it which had taken place on some former occasion; and, 2dly, from the gradual and entire renewal of this fluid after longer or shorter periods, a renewal of susceptibility inevitably supervening, if this property resided in the blood. We must therefore refer the immunity from a second infection to the organic nervous system, and view the susceptibility of this system to have been so affected or specifically changed by the first operation of the poison as no longer to be capable of being roused, by any subsequent application of the same species of poison as previously affected it, to a similar series of morbid changes and actions.

89. *E. The Period of Latency or Incubation—the precursory or formative Period.*—The time which elapses between exposure to infection and the commencement of the febrile action, may be expected to vary much, as it actually does vary, according to the susceptibility of the individual either from constitution or from the influence of predisposing causes, or from the concentration or dose of the poison. I have stated much of what is known as to this matter in the article on INFECTION (§ 32.). All that can be advanced is, that the period is very uncertain. It may be only a few hours, or it may extend to ten or twelve days. Dr. MATON has recorded some cases in which he considered this period to have been prolonged to twenty-four or twenty-five days. The most common period is most probably three or four days, it being rarely shorter than two days, or longer than eight. In a case referred to by M. ROSTAN, in which the disease was induced by inoculation, seven days elapsed before the appearance of eruption.

90. X. PATHOLOGICAL INFERENCES.—It may be useful to conclude this view of the *pathology* of scarlet fever with certain inferences as to those topics connected with the nature of the malady, that have an important relation to the treatment of it, and that should furnish the basis of our intentions of cure.—*a.* The *cause* of scarlet fever appears to be an animal miasm or poison of a specific kind—a specific animal seminium reproducing itself to an indefinite extent.—*b.* It is not proved that this *seminium*, or specific form of fever, is generated, or appears *de novo*, from the combination of circumstances or states shown above to favour the extension of the malady; but, on the contrary, it is much more probable that the disease occurs only from the operation of this seminium, or specific infectious agent, proceeding either directly from a person labouring under the malady, or mediately by fomites which retain, convey, and communicate the seminium.—*c.* The *origin* or *source* of this seminium is not known; but very probably, like small-pox, the disease was first generated by the lower animals, or occurred among them as a pestilence or epizooty, and not unlikely among the equine race, and was thence communicated to man—the seminium formed among these animals having effected the human species in circumstances favouring the extension of it from the former to the latter, among whom it has been preserved ever since.—*d.* The spread of the disease is favoured by certain *conditions of the air*, but what these conditions are is chiefly a matter of inference: a humid, close, and malarious atmosphere appears to favour the extension and operation of the poison; and all the other conditions shown in the article INFECTION to favour or to restrain the extension of infectious agents, exert similar influences in respect of this. Extremes of temperature seem to diminish the spread of the malady, and to render attacks of it more mild.—*e.* The states of those exposed to the morbid poison proceeding from the affected appear either to favour or to resist the action of this poison; and, when favouring it, very remarkably to modify its operation and effects (§§ 84. *et seq.*), conformably with predisposition, susceptibility, diathesis, temperament, and existing constitutional or visceral conditions; the susceptibility of a second infection by the seminium of the malady being annihilated by an attack.—*f.* The poisonous material infects the frame of the healthy in the *manner* fully explained in the article on INFECTION (§ 44. *et seq.*), and developes its *effects* in the course of a period, varying in duration from two to twelve days, or even in a shorter, but very rarely in a longer time, according to the susceptibility and predisposition of the recipient, and the concentration or dose of the poison (§ 76.).—*g.* The effects of the poison, like those of all morbid poisons, are exerted *primarily* upon the organic nervous system, and consecutively upon the vascular system and the blood; and as respects this malady especially, *secondarily* upon the *kidneys*, the *throat* and *skin*; either of these parts, or any two of them, or even all of them, evincing these effects, in a more or less manifest manner; these latter, or local effects constituting the specific characters of the disease.—*h.* The early affection of the *kidneys* in this disease, especially when the affection is such as to impede or to interrupt, or to altogether arrest the *urinary excretion*, produces a change in the blood, in addition to that already occasioned by the infectious agent acting either directly upon this fluid, or through the medium of the organic nervous system; the change in the blood thus produced often occasioning asthenic or diffusive inflammation of serous surfaces, or of predisposed organs, with serous, or sero-albuminous, or sero-fibrinous infiltration or effusion of a watery lymph—causing the several *primary complications* described above (§§ 27. *et seq.*), and already more fully explained (§§ 41. *et seq.*).—*i.* After this malady has run its usual course, it is more liable than any other exanthematous fever, to be followed during desquamation and recovery,—during a period varying from seven or eight days, after the fading of the eruption, to four, or even six weeks at the utmost,—by a consecutive affection of the *kidneys*, indicated by scanty, albuminous, or even bloody urine, and by the presence of epithelial cells in this fluid, sometimes moulded in the fibrine or lymph into the form of the urinary tubes, and consecutively by *œdema*, *anasarca*, or *inflammation*

of *internal parts*, or by *effusion into serous cavities*. — *k*. These *sequelæ* or *secondary complications* result from the consecutive affection of the kidneys (§§ 42. *et seq.*), which appears to consist chiefly of an obstruction caused by the accumulation of exfoliated epithelium in the tubuli and of a deposition of albuminous lymph in the structure of the organ, this latter obstructing the circulation in the capillaries by its pressure, whilst the accumulated organic detritus in the tubuli obstructs the passage of the secretion along these canals, and impedes or interrupts the function of the organ. — *l*. The consequences of the affection of the kidneys, at an early stage of the disease, and of the consecutive obstruction of these emunctories, at a much later period, are, as shown above (§§ 41. *et seq.*), morbid or contaminated states of the blood — a state *of excremential plethora*, consisting of an excess of watery elements and of effete, deleterious, and irritating materials, and saline ingredients. The accumulation of these *excrementitial matters* in the circulation, as well as of *those usually eliminated by the skin*, occasions the several complications—whether inflammatory or dropsical — observed in the course of the malady, or subsequently as sequelæ or reliquiæ. — *m*. Not the least important of these latter is the *anæmia* observed not infrequently to follow the renal and dropsical affections during or consequent upon scarlet fever. — *n*. The occurrence of the usual *sequelæ* of scarlatina is favoured by several physical causes, to which the patient is liable to be exposed during the process of desquamation and recovery; and it is often prevented by measures calculated to restore the functions of the skin, and to prevent vascular determination to, or congestion of the kidneys, and to diminish these, with the other consecutive or associated causes of obstruction of these organs.

91. XI. TREATMENT.—*The treatment of scarlet fever* has hitherto been unsatisfactory, and in the worst forms of this disease most unsuccessful. This has arisen chiefly from our imperfect knowledge of the successive pathological changes produced by the scarlatinal poison, and from the varied character of these changes with the dose of the poison, with the constitution and circumstances of the recipient, with the season and weather, and with the prevailing epidemic constitution. It must be obvious that, if the earlier changes produced by the infecting or poisonous agent be either misunderstood or not recognised, the consecutive alterations will be very imperfectly, if not most injuriously combated; and that our means of cure will be either inappropriately selected, or misdirected. When treating of FEVERS, I have insisted in several places upon the importance of promoting the secreting and excreting functions in all our attempts to *preserve from*, as well as to *cure*, these maladies; for it is chiefly by such measures as promote the depurating action of the emunctories on the blood, through the medium of the organic nervous system, as shown in several parts of this work, that these great ends of practical medicine can be attained.

92. i. PRESERVATIVE TREATMENT. — The fatality of the more malignant types of this malady induced physicians to recommend means for the protection of those exposed to infection; and these means were more frequently advised, and more generally adopted in former times than at present. The uncertain efficacy, or frequent failure of these means, and the hopes of escaping the more dangerous forms of the malady, probably induced a want of confidence in them, of which they are not altogether deserving, especially in some circumstances in which the disease presents itself.

93. Dr. WITHERING remarks, that during the prevalence of the malignant form of the disease in 1778, when every one was alarmed for himself or his connections, means of prevention were anxiously inquired after. "Some smoked, some chewed, and others snuffed tobacco: some daubed their hands and faces with *thieves' vinegar*; many more camphor at the pit of the stomach; and still more swallowed bark and port wine. But those who were much conversant with the disease had too ample occasion to observe that none of these methods were effectual." But Dr. WITHERING had his own notions of prevention based upon a supposition as to the mode in which the poison invades the frame. He believed that the scarlatinal poison "first makes its lodgement upon the mucus separated by the pituitary membrane lining the nose and fauces;" and that those who are exposed to the infection should frequently spit out the mucus that collects in the fauces and promote the discharge from the nostrils. He further advised those who already had imbibed the poison, and had experienced the premonitory symptoms, "immediately to take an emetic; frequently to wash their fauces with soap-leys diluted with water, and to snuff something up the nose that will make them sneeze." After the operation of the emetic he directed the patient to go to bed, and drink plentifully of wine whey with spirits of hartshorn. He states that a large experience enables him confidently to assert that, if these precautions be attended to, the infection will be either altogether prevented, or else very trifling in its consequences.

94. In the latest edition of Dr. WITHERING's treatise, and after an extensive experience, he adds, that the progress of infection may be stopped by precautions which may be adopted in almost every house. He had observed that, when boarding-schools were infected and the children were sent home, the disease was more widely spread; and that he therefore adopted the suggestion of Dr. HAYGARTH, and had for several years past never thought it necessary either to break up a school or to disperse a private family. "Allotting apartments on separate floors to the sick and the healthy; choosing for nurses the older parts of the family, or those who had already had the disease, and prohibiting any near communications between the sick or their attendants and the healthy, with positive orders instantly to plunge into water all the linen, &c. used in the sick chambers, have universally been found sufficient to check the further progress of infection." These recommendations are deserving of adoption, and confirm the opinion which I have stated above (§ 79.).

95. Dr. SIMS remarks, that the best preventive of the disease was found by him to be rhubarb taken in the morning in such quantity as should produce one loose motion in the day. He did not see one who used this confined afterwards to bed, though several persons began it after they were infected, but before the time of their sickening. Dr. R. WILLIAMS considers Dr. SIMS' authority to be quite as veritable as that of HAHNEMANN, and

his charm even more valuable than that of the latter. Probably any single *prophylactic*, of whatever kind, owes much of the influence it may exert to the confidence reposed in it by the person who has recourse to it. As fear favours, so does confidence resist infection; and when the object of confidence is such as promotes the several assimilating, excreting, and depurating functions, without lowering vital resistance, it combines the virtue of a *charm*—of a mental agent, with its physical operation. The hypothesis of HAHNEMANN is, that diseases are best combated by remedies which produce morbid actions similar to those constituting the diseases themselves; and consequently, as belladonna is capable of producing an efflorescence similar to scarlatina, that it is a preservative against this disease. He asserts that one-eightieth part of a grain of belladonna given twice a day will preserve a susceptible person from an attack of scarlatina; — or that three grains of the extract dissolved in an ounce of distilled water, and three drops of the solution given twice daily to a child under twelve months old, and one drop more for every year above that age, will be sufficient for this purpose. It is possible that belladonna, by its irritant and alterant effects (see art. POISONS, § 537. *et seq.*), may render the system insusceptible of the scarlatinal infection, independently of the principle or law for which HAHNEMANN has contended, empirically and absurdly and in defiance of both reason and argument. It may possess this particular virtue, by producing its specific effects, without furnishing any support to the irrational doctrine, the monstrous absurdity, and the most nefarious practice, which he has originated and promulgated — a practice which knaves alone can adopt, and to which fools only will submit. It is obvious that belladonna can exert no protective influence until it produces, by the continuance of its use, or by its dose, its specific effects, and hence that, even admitting its efficacy, in virtue of these effects, it must frequently fail when it is not given in due season. As to its efficacy, opinions, even in Germany, are much divided; some, with ETTMULLER, SPEUN, BERNDT, KOREFF, HUFELAND, &c. confiding in it; others, with SALZER, and several beside, stating that they have found it inefficacious; whilst many agree with HILDENBRAND in treating it with ridicule.

96. Calomel was recommended by KREYSIG and SELIG as a prophylactic, and as tending to lessen the severity of the attack, when it failed of averting it altogether. THEUSSINK advised the calomel to be conjoined with the golden sulphuret of antimony. EICHEL believed in the efficacy of emetics, as advised by WITHERING, especially when they are followed by diaphoretics. Several writers have recommended the mineral acids. I have reason to believe that the nitro-hydrochloric acids are not devoid of efficacy as a prophylactic; and that capsicum may be placed in the same category, especially when conjoined with small doses of camphor and quinine. The most certain prophylaxis is, however, to be found in the adoption of those measures which I have fully detailed in the article INFECTION (§§ 55. *et seq.*), when treating of its prevention and counteraction, and in that on PESTILENCE, PROTECTION FROM.

97. ii. CURATIVE TREATMENT. — It is obvious from what has been advanced, that the treatment of scarlet fever should be directed with strict reference — 1st. to the type and form of the disease, — 2d. to the character of the prevailing or stationary epidemic constitution, as insisted on above (§ 10.); — and 3d. to the pathological conditions, primary and secondary, to which I have endeavoured to direct special attention. With these objects in view, I shall *first* describe the means which are most appropriate in the different forms of the malady; and *next* remark upon the several remedies which have been recommended by the best authorities, and the circumstances in which they may be most beneficially resorted to. Without failing to give these authorities their due weight, I shall be guided chiefly by the results of my own observation and experience.

98. *A. Simple Scarlatina — S. Mitis — S. Simplex.* — Mild or simple scarlet fever (§ 18.) may require but little treatment beyond attention to ventilation and diet, and to the several excreting functions, especially if the febrile symptoms be slight. If, however, the pulse is quick, sharp, or rapid, or the skin hot, the quantity, appearance, and character of the urine should be carefully examined, and if this excretion be scanty, and the fever considerable, although the disease may appear simple and regular, yet it may assume, even in the course of a few hours, a much more severe form. If there be vomiting at the commencement; and more especially if the retchings be attended by pain in the loins or limbs, and scanty or suppressed urine, an emetic should be exhibited, and its operation be promoted by demulcent diluents, and warm diaphoretics; and the functions of the skin be promoted by the tepid bath. The action of the emetic tends both to remove the congestion of the kidneys either already existing or apt to supervene in these cases, and to determine to the surface of the body. If the patient be strong or plethoric, and if the prevailing epidemic constitution do not contra-indicate this measure, a small or moderate cupping over the loins; and, in different circumstances dry-cupping in this situation, may be practised if the symptoms are not mitigated by these means. The bowels should be evacuated by suitable aperients — by one or two doses of calomel and antimony, followed by saline aperients, as the phosphate of soda, &c. taking due care merely to promote and to evacuate the secretions and excretions without causing unnecessary irritation.

99. The chief *intentions* directing our practice, in the milder cases of the disease, are, — 1st. to prevent the increase of febrile action, — 2d. to promote the excreting and depurating functions, —3d. to remove local congestions and determinations, whenever and wherever they occur; and 4th. to preserve or to restore the functions of the skin and kidneys after the subsidence of the eruption, and during the process of desquamation. If we fail in the complete fulfilment of these intentions, the indications and means about to be described should be adopted, appropriately to the phases through which the disease may pass, and to the complications which may supervene. Although the mild and regular form of the disease generally proceeds favourably, yet, owing to many disturbing causes, and not infrequently in consequence of the nimia diligentia medici, it may assume a serious or complicated form, more especially when vital power is suddenly reduced, when

excreting functions are interrupted, or when local determinations are favoured or occasioned.

100. *B. Scarlatina anginosa — S. inflammatoria.* — The more inflammatory types or states scarlet fever (§ 19.) generally require prompt and active measures. But it ought not to be overlooked, that the terms here employed to designate the more *sthenic forms* of the malady are altogether arbitrary — that many mild, as well as all the malignant states of the disease are anginous; and that, whether simple, regular, mild, anginous, or malignant, it may also be inflammatory; the great and essential difference being the degree in which sthenic or asthenic action is present — in the amount of organic nervous or vital power, and in the state of the circulating fluids. This type or form of the disease requires a modified, or even very different, treatment according to the phases it may assume, and the grades of vascular action and vital power, as different or individual cases pass through the various phases from the mild to the inflammatory, or from the simple and regular to the complicated or malignant (§ 20.).

101. (*a.*) In the more *sthenic diathesis*, or *inflammatory* type, of this fever, an *emetic* of ipecacuanha, or of ipecacuanha and antimony, is generally of service, especially at an early period; and its operation should be promoted by warm diluents. It is not the less beneficial when vomitings are already complained of, and the urine is scanty, and pains in the loins are present. In these latter circumstances, especially when the pulse is full or strong, the abstraction of blood from the loins by *cupping*, the quantity taken being such as the age, habit of body, and peculiarities of the patient will warrant, is generally beneficial; but *bleeding* from a vein is seldom of service — more generally prejudicial, unless in the more sthenic diathesis and robust constitutions. If generally adopted, bloodletting is a destructive practice, unless in rare epidemic visitations, when the prevailing epidemic constitution admits of the practice, with such limitations and cautions as the nature of the disease and the peculiarities of the case suggest. During the stationary epidemic constitution from about 1810 to 1820 or 1825, bloodletting, even in this disease, especially in its more inflammatory types, was much better tolerated than subsequently; and some writers considered their recommendations of it as sufficient to constitute it the chief remedy, in all circumstances, and for all time; denouncing those who had preceded them for advising different means, although more appropriate for the types of the disease for which these means were employed. More recently, and since late writers have ascertained that bloodletting should be most cautiously employed, even in the most inflammatory type, cupping on the nape of the neck, or the application of leeches behind the ears, has been advised for the more sthenic anginous form of the malady, and often practised by myself for many years. But, when pain in the loins and limbs, and scanty, high-coloured, or otherwise morbid urine, or suppression of urine, are present, I then have preferred the abstraction of blood by cupping over the regions of the kidneys, to an amount dictated by the peculiarities of the case, and have prescribed the following *embrocation*, to be applied by means of flannel or spongio-piline around the neck and throat; or either of the *liniments* in the APPENDIX (see FORM. 295, 296. 307. 311.) to be thus employed. If either of these applications produce external inflammation or discharge from the surface, the consequences are never troublesome, as sometimes observed when blisters are used.

No. 335. ℞ Linimenti Terebinthinæ, ℥ij; Linimenti Camphoræ Comp. ℥j; Olei Olivæ, ℥iij; Olei Cajuputi, ʒj. *m.* Fiat Embrocatio more dicto utenda.

102. When the emetic action has subsided, the bowels should be gently or moderately evacuated by means of *calomel*, either alone, or with rhubarb or jalap, or with the addition of magnesia or the dried sub-carbonate of soda; and followed by manna, salts, &c., in the infusion of roses or of senna; or by castor or olive oil, according to circumstances; or by equal parts of the compound infusions of gentian and senna, with the carbonates of soda and ammonia.

103. The great heat of skin in this state of the disease suggested a recourse to the *affusion of cold water* on the surface, as too strenuously and indiscriminately advised by Dr. CURRIE. When I commenced practice I adopted this treatment in scarlet fever, and extended it to several other diseases, and certainly with more benefit in them than in this. For, in the more sthenic forms, it was soon followed by an equal, or even by an increased heat of the surface, and in the more asthenic conditions, it appeared to favour the developement of internal complications: in most of the forms of the malady, it contingently favoured congestion of, or determination of blood to, the kidneys, and thereby aggravated the disease. I therefore relinquished the practice, and substituted the *tepid bath*, or the *cold or tepid sponging* of the surface, using simple or medicated fluids for this purpose, according to existing states of the fever; and preferring of the latter, such as were emollient and alkaline.

104. After moderate evacuations from the bowels, saline mixtures or draughts, of a *diaphoretic* and *diuretic kind*, in a state of effervescence, will always be agreeable, and tend to moderate the febrile action, as the acetate or citrate of potass, with the acid in excess, in the more sthenic cases; or the acetate or citrate of ammonia, with the ammonia in excess, in the more asthenic; and with the spirits of nitric æther with either, will be generally appropriate. In this form of the disease, *gargles* have been very generally recommended, and are sometimes of service when their composition is such as suit the state of the case. Those which are cooling, or which contain the nitrate of potass, or the hydrochloride of ammonia, are the most grateful and beneficial. Children can use them only as washes for the mouth; but they are useful as such; and they may be injected into the mouth and throat of younger children; or a clean sponge, attached to a piece of whalebone, may be moistened with them, and be employed to cleanse the mouth and throat from time to time. The infusion of roses, or of cinchona, or decoction of cinchona, or red wine and water, or camphor or rose water, may be employed as the vehicle for these salts, or for the other substances which may be used in this manner. (See Form. 158—167, in the APPENDIX.)

105. A prompt recourse to the means now advised will generally prevent the occurrence of the *complications* (§§ 27. *et seq.*) often met with in this form of the disease, more especially if these

means secure a free excretion of urine. But if any local determination or complication arise, notwithstanding; or if it have taken place before the treatment was commenced, the agents used for combating it should have strict reference to the existing state of vital power. *Local depletion* will often be of service when power is not much reduced; but we must not expect that the complication, however inflammatory it may seem, is to be removed by depletions only or even chiefly. The pathological source of these complications, as already explained (§§ 28. *et seq.*), will show the futility of the expectation. Whilst the local depletion may tend to reduce the vascular fulness, local and general, means should be employed to rouse the action of the kidneys, to determine to the cutaneous surface, and to promote the secretions and other depurating functions. In the circumstances now being considered, there are no means more efficacious, especially in restoring the functions of the skin and kidneys, and in deriving from the seat of local affection, than flannel cloths coming out of hot water, freely sprinkled with the spirit of turpentine, or with the embrocation just prescribed (§ 101.), and applied either over the epigastric and abdominal regions, or over the loins. This *epithem* should be covered with oiled silk, or with a warm napkin, so as to confine the fumes from it as much as possible to the surface of the body. In most of the complications of this form of the disease, the bowels should be preserved in a moderately open state, by the means already mentioned (§ 102.), or by castor or olive oil; and their action may be promoted by the occasional administration of an *enema*, containing either or both these oils, with spirit of turpentine. The cooling diaphoretics and saline medicines advised above (§ 104.) may also be given from time to time in a state of effervescence, or otherwise. If the bowels be irritated or too much relaxed, the liquor ammoniæ acetatis may be given with the ammonia in excess, and with the tinctura camphoræ composita, or the syrupus papaveris; and the epithem or embrocation already prescribed should be assiduously applied over the abdomen.

106. (*b.*) When the anginous or inflammatory form of scarlatina assumes more of the *asthenic* diathesis or type, and according as it approaches the malignant form, the treatment should be modified. In these states even local vascular depletion is either inefficacious or injurious. But *emetics*, especially early in the attack, are generally beneficial. The other means already stated are also of service, more particularly the terebinthinated *epithem* or *embrocation*, and the saline diaphoretics; and, if congestions of internal parts take place in this state of the disease, the epithem or embrocation should be energetically employed. If an aperient be required, a moderate dose of the spirit of turpentine should be added to the oils, advised above (§ 105.), and be administered by the mouth, or as an enema, as the circumstances of the case will suggest. In the less urgent or dangerous cases of this form, and in the complications which may supervene, the internal and external means already recommended will generally be appropriate; but the urinary excretion should always receive attention; and when it becomes scanty or suppressed, an ipecacuanha emetic should be given, and the terebinthinate epithem or embrocation be applied over the loins, and the spiritus ætheris nitrici and liquor ammoniæ acetatis be prescribed in sufficient quantity. In proportion as the case assumes, either primarily or consecutively, a malignant character, so ought the means about to be advised for the next form of the disease to be employed.

107. *C. Scarlatina maligna — Malignant Scarlet Fever* (§§ 20. *et seq.*), is often so sudden in its seizure and so rapid in its progress as to require the most efficient means, with the utmost promptitude; and, if the means be either inefficient or delayed, the extension of the affection of the throat to the adjoining passages, and the supervention of complications, which vary or differ in different cases, are common results. The severity of the affection of the throat, in these cases, has frequently induced the practitioner to apply leeches to the neck or behind the ears; but they are generally injurious, more especially when the pulse is very rapid and compressible. Even local depletions in this form of the malady are rarely of service; and when leeches are applied to the neck or throat, diffusive inflammation of the cellular tissue, in connection with enlargement of the parotids, &c., either extending from the internal parts, or excited more externally by the leeches, is not an infrequent result. Whatever may be the state of the urine, — however morbid or scanty this excretion may be, as it usually is, in these cases, — an *emetic*, consisting either of ipecacuanha or of sulphate of zinc, or of both, to which a little pulvis capsici may be added, should be given without delay, and its operation be promoted by drinking a warm infusion of chamomile flowers, or of bark, — the latter made weak in proportion to the quantity to be taken, — and the terebinthinate embrocation or epithem ought also to be applied over the loins, in the manner advised above. The throat should also be surrounded by either the embrocation or the epithem. In a very short time, the relief which the patient will experience, especially as respects the state of the throat, will be remarkable; but, to render the relief permanent or progressive, further means should be employed.

108. In this state, the decoction of *cinchona* should be given every three or four hours, with the carbonates of *soda* or *potash*, or *ammonia*, either in a state of effervescence, the alkali being in excess, with acetic or citric acid, or with the carbonate of the alkali only. If the decoction be not taken with the acid, the fixed and volatile alkalies may be given at the same time, with the addition of the spiritus ætheris nitrici and tincture of serpentaria. It is often difficult to determine whether or not the decoction should be combined with an *acid* or with an *alkali*, in the more malignant states of scarlatina. The choice should depend, in some measure, on the state of the urine. If this excretion be not suppressed, and if it be alkaline or contain phosphates, the cinchona should be conjoined with *hydrochloric acid* and *hydrochloric æther*; or the *sulphate of quina* may be given, in the infusion of roses, with dilute *sulphuric acid* and *sulphuric æther*, or the compound spirit of æther. When, however, the urine is suppressed, or nearly so, and when it presents an acid reaction, or is albuminous, or bloody, after having recourse to emetics and terebinthinate epithems over the loins, I have generally preferred

a combination of the decoction of cinchona with the liquor ammoniæ acetatis and the carbonate of ammonia; or with either of the alkalies, in a state of effervescence with a vegetable acid. (See APPENDIX, Form. 385. 388. 416. 437.) More than half a century ago Dr. GARNETT recommended the *chlorate of potash*, with or without the decoction of bark, in malignant scarlatina; and Dr. CLUTTON the *hydrochloric æther*. I have often prescribed them both since 1820, in public and private practice, and with marked benefit, in the malignant or putro-adynamic states of the disease, appearing either primarily or consecutively. If the symptoms are not ameliorated, an emetic should be again administered, and even repeated, but it should be conjoined with capsicum, or some other stimulant; and the decoction of cinchona, combined as above, should be continued afterwards, with the addition of either the compound tincture of bark, or the tincture of serpentaria or of capsicum, the embrocation or epithem being repeated, and the bowels moderately evacuated by the means already suggested (§§ 102, 105.).

109. In the more putro-adynamic or malignant states of the disease, *chlorine* and the alkaline *chlorides* have been given with benefit, either alone or conjoined with the means already mentioned; but the external applications advised above, and the evacuation of morbid secretions and excretions by emetics and the aperients already prescribed, should not be neglected. Frequent and considerable doses of powdered *carbon*, or charcoal, have also been given, and on several occasions by myself, conjoined with *quinine*, or powdered *cascarilla* and *cinnamon*, or with the addition of *camphor*, *creosote*, and two or three drops of the tincture of *capsicum*. These, mixed in treacle, have a good effect in correcting the morbid action and secretions in the throat and fauces, especially when aided by the application of the terebinthinate embrocation around the throat. When the throat and fauces are much affected in this form of the disease, as is generally observed, not only should these substances be taken, either in treacle, or in syrup or conserve of roses, or such other vehicle as would form them into a *linctus*, but the *gargles* mentioned above (§ 104.), or those referred to in the APPENDIX, should be employed, in the manner there particularised, in the intervals between the administration of the other means. Gargles, however, are often unavailing, and in children can be employed only as washes in the manner already noticed. In the more severe and malignant affections of the throat and fauces, the application, by means of a brush, or sponge attached to a piece of whalebone, of a strong solution of *nitrate of silver* (ʒj. or ʒss. to an ounce of water), or of *alum* in *acetic acid*, will be much more efficacious, especially when early adopted. In this very malignant state of the disease, it may be necessary not to rest satisfied with quinine, or preparations of cinchona or serpentaria, capsicum, camphor, ammonia, chlorine, &c., as severally above prescribed, but also to give *wine*, or even *brandy*, with various farinaceous or dietetic substances, as sago, arrowroot, yelk of eggs, &c., or with certain beverages, as Seltzer water, soda-water, or ginger-beer, or spruce-beer.

110. *D. Scarlatina sine Exanthemate.—Scarlet Fever without eruption* should be treated with strict reference to the character of the attendant fever and to the state of the throat. Some of these cases present more or less of an inflammatory diathesis, whilst others are remarkably asthenic, or are attended by extreme depression of vital power. According as these different states occur, so should the treatment be directed, conformably with what has already been advanced. When vascular depletion is indicated in this form, the evidence which I have observed of congestion of the kidneys and the state of the urine have induced me to direct *cupping* on the loins, followed by the terebinthinate *epithem* or *embrocation*, in that situation; and around the neck and throat, if the fauces are much affected. I have already contended, that the primary affection of the kidneys, in this form of the malady, very often prevents the developement of the cutaneous eruption, and that the consequent imperfect depuration of the blood by these organs causes various internal complications. The removal of this congestion or affection of the kidneys should therefore be a primary intention of cure; and when the state of constitutional power does not admit of vascular depletion, as now advised, it should be attempted by the exhibition of *emetics*, by *dry-cupping* on the loins, and by the terebinthinate application already mentioned. *Purgatives*, especially those already mentioned, administered by the mouth or in enemata, and the other means specified above, according to the character of the fever and state of vital power, are generally also required. In this form, various complications are apt to appear, either at an early or at an advanced stage, generally owing to the pathological cause already assigned. The head, the lungs, the pleura, or the digestive mucous surface, &c., or even two or more of these, may manifest the most serious and even the most rapidly disorganizing change, and require the most efficient and prompt measures. If the morbid action approach, and according as it possesses, a sthenic character, local vascular depletions are necessary; but no dependence should be placed on those alone. The functions of the kidneys should be strictly examined, and the treatment be directed to them. Cupping or dry-cupping, followed by the terebinthinate applications, in that quarter, emetics, saline diaphoretics conjoined with diuretics, warm medicated baths, especially warm baths containing salt or carbonates of the alkalies, with mustard, are amongst the chief means of cure in these and similar cases. When vital power appears extremely depressed, or exhausted, the tonic and restorative remedies advised above (§§ 108, 109.) must be prescribed in order to resist the tendency in these circumstances to contamination of the circulating fluids and to fatal sinking.

111. *Blisters* have been recommended by many as derivatives, especially when internal complications occur in this form of the malady; and, in adult subjects, they are often of service, although not so immediately and generally beneficial as terebinthinate epithems and embrocations, when these latter are judiciously employed. In children, blisters, even when cautiously managed, are often dangerous applications in scarlatina. Mustard poultices are preferable, but are much inferior in efficacy to the terebinthinate embrocation.

112. When the affection of the *throat* is very malignant or threatens to extend to the adjoining passages, especially if it advances to the *larynx*, then emetics, especially such as have been advised above (§ 107.), should be administered, and the constitutional powers fortified by tonics so as to resist the extension of the local mischief; and the throat and neck should be surrounded by a terebinthinate epithem or embrocation. Blisters in these cases are generally more injurious than beneficial; and the same may be said of *mustard poultices*, when applied to the throat. Emetics consisting chiefly of mustard have been given in these cases, but they often irritate the throat too much during deglutition, and are not so immediate or certain as the sulphate of zinc or ipecacuanha, or as a combination of these. When an ichorous or excoriating discharge proceeds from the throat, fauces, &c., or when these parts indicate or manifest a sphacelating state of ulceration, then the application of *pyroligneous acetic acid* with *creasote*, or the strong solution of *nitrate of silver*, prescribed above (§ 109.), by means of a sponge, to the affected surface, or the use of *gargles* containing these substances, with the addition of the tinctures of *myrrh* and *krameria*, and the administration of *tonics* and *restoratives* internally, are chiefly to be confided in.

113. *E. Scarlatina Latens—Latent, suppressed, or masked Scarlet fever*, in which neither eruption nor sore-throat appears, is comparatively rare, but it is a most serious, and often a fatal form of the disease when it occurs (§ 26.). It would seem, as above stated, that the scarlatinal poison or infection primarily affects the kidneys, in this form, or both the kidneys and serous membranes, primarily and chiefly; the affection of these parts preventing the developement of the disease in the throat and skin, and rapidly increasing the contamination of the blood, and the effusion into serous cavities. In these cases, the disease has proceeded to effusion either into the cellular tissue, or into a serous cavity, before medical care is required. In all the instances which I have seen, the urine was either suppressed or very scanty, albuminous and sometimes bloody, from the earliest period of the recognition of the nature of the affection: and there were, moreover, febrile symptoms, with sickness and vomitings, and pain in the loins and limbs, for at least one, or two, or even more days, before any indications of œdema or internal local affection had appeared. When, therefore, these phenomena are observed in susceptible persons, in the same family, house, or locality in which scarlet fever prevails, then should energetic measures be instituted to remove the active vascular congestion manifestly existing in the kidneys, and not infrequently also in other parts, and rapidly inducing further and most irremediable changes. But these measures should, as in other circumstances of the malady, have strict reference to the existing states of vascular action, in connection with constitutional power or resistance. *Cupping* over the loins, or even a repetition of it, and immediately or soon afterwards procuring full vomiting by *emetics*, are the means which should be first and promptly employed. When blood cannot be further abstracted without risk, then *dry-cupping* may be substituted; and terebinthinate *epithems* or embrocations should be applied over the loins, or over the region of the prominently affected organ or part, and repeated or persevered in, according to the effect produced on the system and on the local affection, and more especially on the functions of the kidneys. In some cases it will be most advisable to cause the patient to be placed in a *tepid* or *warm bath* after the cupping and operation of the emetic; and the effect of the bath may be increased by adding either the carbonate of potash or the carbonate of soda, or common salt, and the flower of mustard to the water, so as to determine to the surface of the body, and procure a free cutaneous exhalation. This intention will be promoted by applying, immediately after the patient is removed into bed, the terebinthinate epithem or embrocation, as just advised, and by prescribing *saline diaphoretics* and *diuretics*, especially such as contain the liquor ammoniæ acetatis and spiritus ætheris nitrici. The state of the bowels also requires attention. A full dose of *calomel*, either alone or with an *antimonial*, should be given after the operation of the emetic, and even repeated after a few hours; and some hours afterwards, either of the *purgatives* mentioned above (§ 102.) ought to be administered, and be followed by the terebinthinate *enema*, if the evacuations be not sufficiently free; or if a purgative be subsequently required, without interfering with the exhibition of the diaphoretics and diuretics indicated by the state of the case. As this form of the malady is usually more or less complicated (§ 26.), the means about to be further suggested in respect of the complications of scarlatina, are equally applicable to it as to the other forms of the malady.

114. *F. The complications of scarlatina* are often the chief causes of danger, and hence require the most active and best devised means. The remedies which most of those complications require, have been in great measure anticipated by my remarks on the curative treatment of the several forms of the malady, for it is inconsistent with the due consideration of the subject to separate the complicated, and hence the most severe states of these forms from those states or phases into which they insensibly pass. There remain, however, a few prominent topics, or pathological conditions of importance, which occasionally present themselves as dangerous emergencies, and which require a more especial notice.—(*a.*) I have already insisted sufficiently on the prominent *affection of the kidneys* (§ 28.), which may be detected at an early stage of many of the more severe and complicated cases of scarlatina, and have fully stated the means which I believe to be most efficacious in removing it, viz. cupping, or dry-cupping, or both, on the loins, followed by emetics, terebinthinate applications, the tepid or warm bath, simple or medicated, diaphoretics and diuretics, &c.

115. (*b.*) The extension of an asthenic or *diffusive form of inflammation* from the throat and pharynx to the *larynx*, or along the *Eustachian tube to the ear* (§§ 30—32.), is to be prevented chiefly by emetics; by the application of terebinthinate epithems around the throat; by tonics or restoratives, in order to increase the vital resistance to the spread of the local mischief; and by antiseptic and astringent gargles, washes or similar applications tending to correct or arrest the local morbid action (§§ 104, 109.). *Hæmorrhage* from the nose, throat, or ears, requires consideration. If it take place from the nose—epistaxis—and especially if

the patient be subject to this occurrence, it may prove critical, especially in the more inflammatory or sthenic cases, and should not be prematurely interfered with. But, an intercurrent epistaxis, even in these cases, if too profuse, but still more readily in the malignant or asthenic, may so reduce vital power, as shown above (§ 33.) as rapidly to sink the patient. Therefore, in this latter state of the disease, and especially when the blood proceeds from the mouth, throat, or ears, the hæmorrhage should be arrested, if possible, as soon as may be, by the astringent gargles or washes for the mouth already mentioned (§§ 104, 109.), pecially those containing the pyroligneous acetic acid and creasote. The difficulty of arresting the bleeding is always the greatest in the most malignant cases, owing to the state of both the blood-vessels and the blood circulating in them. In these cases the attempt to arrest it should be made early; and if the means already indicated, aided by tonics and astringents taken early, should fail, the administration of the spirits of turpentine internally, either in considerable or frequently repeated doses, ought not to be delayed; for this is one of the most energetic anti-hæmorrhagic medicines which can be prescribed — if, indeed, it be not the one chiefly to be relied upon in these and similar cases.

116. (*c.*) *When diffusive inflammation of the cellular tissue of the neck or throat* occurs (§ 34.), then the most active tonic and stimulant remedies are required, in connection with antiseptics, both internally and externally. The selection of these should be made, as already advised (§ 108.), with reference to the state of the excretions, and more particularly of the urine, the same indications guiding the choice as have been there mentioned. The means which have been already advised for the most malignant form of this malady (§§ 107. *et seq.*), and for *diffusive inflammation of the cellular tissue* (see CELLULAR TISSUE, §§ 34. *et seq.*), are also appropriate in this complication.

117. (*d.*) *Gastro-enteric disorder with diarrhœa* (§ 35.), is a frequent occurrence, and requires an early recourse to astringents, antacids and aromatics, especially when it is consequent upon malignant affection of the throat, and is attended by suppression of the eruption. In these circumstances coma soon supervenes from exhaustion, if vital power be not duly supported by suitable tonics and stimulants. The warm bath, containing salt and mustard; terebinthinate embrocations over the abdomen after coming out of the bath; the infusion of cascarilla or of cinchona, or the decoction of the latter, with lime water, or with ammonia, camphor, compound tincture of camphor, capsicum, or other aromatics, or aromatic confections; wine or brandy, with spices, in farinaceous preparations, as advised above (§ 109.); or the means which are recommended in the enteric complications occurring in continued fevers (see FEVERS §§ 549. *et seq.*) and in MEASLES (§§ 75. *et seq.*), are severally beneficial. I have recently prescribed *salicine* in this complication with great advantage, in doses varying with the age and severity of the bowel affection, and in conjunction with the substances just mentioned in the more obstinate cases. The bark of the willow may be given in decoction, infusion or powder (from 5 grains to ℈ij); or the salicine in doses of one grain to five or six.

118. (*e.*) *Convulsions, coma*, &c. (§ 36.), are most unfavourable complications, although not necessarily fatal. The former occur chiefly in young children, sometimes on the accession of the disease; the latter in both children and adults. They are both, even when occurring early, often consequences of obstruction of the urinary excretion, although the cause is generally overlooked. When these affections appear early, and manifestly from this circumstance, cupping over the loins, or the application of a few leeches in this situation in young children, the warm or tepid bath, terebinthinate embrocations on the back, and active purgatives are generally required. When the symptoms in other respects display no putro-adynamia, and when the pulse retains some strength as well as fulness, then vascular depletion is more beneficial than in some states, in which it is more commonly resorted to. Calomel with antimony, or jalap, and followed by other purgatives, especially by castor oil and spirit of turpentine, and by terebinthinate enemata, are generally necessary. When coma is obstinate, then a full dose of spirit of turpentine, according to the age of the patient, with assafœtida and camphor, should be administered as an enema; and, as soon as the bowels are freely evacuated, saline diaphoretics, and diuretics may be given. In some severe cases of this complication, I have directed the head to be surrounded, and the vertex to be covered, by flannel moistened with turpentine, or with the terebinthinate embrocation prescribed above (§ 101.). During the treatment the state of the urinary function should be carefully ascertained, and if it be suppressed or scanty, endeavours should be made to restore it, and at the same time to excite other emunctories or depurating organs to increased action, especially the skin and bowels. The existence of coma or convulsions should not prevent the administration of emetics, when the measures just advised have failed; for the emetic action both rouses the action of the kidneys and determines to the surface of the body, whilst it procures a discharge of fluid from the digestive mucous surface, thereby relieving the vascular system from a portion of the serous fluid over-distending it, and congesting the vessels of the brain.

119. (*f.*) The appearance of either of the *affections of the lungs, bronchi or pleura* (§§ 37, 38.), or even of the *peritoneum* (§ 39.), which often complicate the severer cases of scarlatina, especially the forms unattended by eruption, requires both judicious and prompt measures. If either occur during the eruptive stage, and more particularly if it be followed by the sudden disappearance of the eruption, local bloodletting is generally necessary; but the quantity of blood which may be taken, and the propriety of taking any, as in all other circumstances, should depend upon the state of the pulse, upon the existence of deficient vital power, or of putro-adynamia, and upon the state of the urinary function. Cupping, or the application of leeches, followed by dry-cupping, and the terebinthinate embrocation or epithems, assiduously or repeatedly applied, are the principal means of cure. But we should not confide too much in vascular depletion even in these complications, especially in some epidemics, and in certain localities which depress vital power and render the disease either malignant

or complicated (§ 85.). The external applications just mentioned are often more beneficial than any other means, especially when aided by appropriate internal remedies, as the liquor ammoniæ acetatis, spiritus ætheris nitrici, and moderate doses of camphor. It sometimes becomes a question as to the situation, in which local depletion, and external applications should be employed, If in these complications, as not infrequently observed, the urine is either suppressed or very scanty, or bloody, or albuminous, the local affections being the consequences of obstructed elimination and depuration by the kidneys, the loins are the situations in which these means should be applied, especially in the first instance; but otherwise over or near the chief seat of local complication. In other respects the treatment may be the same as just advised for coma or convulsions (§ 118.).

120. *G. The sequelæ of scarlatina* are sometimes more dangerous than the primary disease. The consecutive affection is generally *caused* by *errors in diet or regimen* during the process of desquamation, and during recovery; and the treatment should, therefore, be directed with reference to these causes. During early convalescence the digestive functions are weak, and the primary processes of assimilation are imperfectly performed, unless the nature and quantity of the aliment be such as will be readily and perfectly disposed of. As the appetite during convalescence is greater than the power of digestion, food is often taken of a kind and quantity furnishing a chyle unsuited, owing to imperfect digestion, to the state of the blood, and which, in conjunction with the large proportion of effete materials, absorbed from the various tissues and surfaces, and carried into the blood during the advanced stages of the disease and during convalescence, renders the blood either too irritating or otherwise injurious to the excreting structure of the kidneys; and this effect upon these organs is heightened by the interruption to the eliminating or depurating function of the skin during early convalescence, the kidneys thus sustaining, during this period, the whole burthen of depurating function, at a period, moreover, when the blood most remarkably and unusually abounds in hurtful and irritating materials, derived from imperfect assimilation, and from the absorption and accumulation of effete molecules and structural elements derived from the several tissues, — these elements or materials constituting the urea, uric acid, animal extractive matters, &c., forming the products of a destructive assimilation, or the ultimate products of animalization. It must be further manifest that if the blood, thus loaded with effete or irritating materials, be determined in unusually increased quantity to the kidneys by exposure to cold, by damp clothes, or insufficient clothing or other causes, even by great humidity of the air, these organs will sustain, as respects their minute excreting structure, more or less irritation or other injury, interfering with or interrupting their eliminating function, the blood thereby becoming still more impure and consisting of an increased proportion of watery and extractive constituents, as already more fully contended for (§§ 28. *et seq.*). These *causes* and their *effects* upon the frame — the *primary effects* now shown, and the *secondary effects*, constituting the several sequelæ of the malady, — being manifestly and certainly those just stated, it follows, that the means most appropriate to the removal of the *secondary effects* or sequelæ, are such as will most efficiently remove the *causes* and *primary changes* which produce the secondary effects or sequelæ, whatever these latter may be.

121. Conformably with these pathological principles, the treatment should be directed — 1st. To the state of the kidneys, as indicated by the condition of the urinary function and excretion, and by other signs or symptoms; — 2nd. To the causes, extrinsic and intrinsic, remote or pathological, of the state of these organs; — and 3rd. To the secondary affection, or sequelæ, resulting generally either from the persistence of some lesion which originated during the course of the malady, or from the affection of the kidneys caused as just shown (§ 120.).

122. (*a.*) *The prevention of the affection of the kidneys*, upon which the most frequent of the secondary diseases or sequelæ of scarlet fever chiefly depend, should be a principal object in the treatment of this malady. During desquamation and early or advanced convalescence—for a month at least after the disappearance of the eruption—the patient's *diet* and *regimen* should be strictly prescribed, however mild the disease may have been. The food should be bland, light, and digestible, chiefly farinaceous, so that as little as possible of the irritating materials to the kidneys should accumulate in the blood. The *beverages* of the patient ought also to be of a bland or demulcent kind, and consist chiefly of soft or distilled water, wine and malt liquors being avoided. Exposures to cold, currents of air, to humid and cold states of the atmosphere should be carefully prevented, and the clothing ought to be warm. The due restoration of the functions of the skin should be attempted early in the stage of desquamation by recourse to tepid or warm baths, in which a quantity of the sub-carbonate of soda or potash, or biborate of soda is dissolved; and the secretions and excretions duly promoted by purgatives or aperients, and by diaphoretics. By attention to these, the sequelæ of scarlatina proceeding from obstruction of the kidneys will rarely be observed.

123. (*b.*) If, notwithstanding these precautions, or owing to the neglect of them, the state of the urinary excretion or other symptoms indicate *congestion or obstruction of the kidneys* (§ 49.), the treatment should be directed chiefly to these organs. Unless the constitutional powers have been, or still are, extremely depressed, the antiphlogistic regimen, medicinal and dietetic, ought to be adopted. As this affection is so often the result of over-feeding during convalescence, or of a too early recourse to animal food and exciting beverages, these causes should receive due attention; and if the mischief can be referred to them, not only ought they to be prevented, but the removal of the disorder should be attempted chiefly by means of local depletion from the loins, of purgatives and diaphoretics, by the tepid and warm bath, and by terebinthinate epithems or embrocations applied over the regions of the kidneys. The vascular depletion may even be repeated, for it is not unusual to find the sequelæ of scarlatina to require, and the patients affected by them to tolerate, the bleeding more than in any of the previous stages of the malady.

124. (*c.*) When *anasarca* or *effusion into any*

serous cavity, or from any serous surface (§§ 50—55.), is consequent upon this disease, in the manner now shown, the effusion, in whatever situation it may occur — between the membranes, or in the cavities of the brain, in the pleura or pericardium, in the peritoneum, or in the capsules of the joints, — is the consequence of active determination of blood to, or of irritation of, these membranes, caused by vascular excrementitial plethora, as above contended for (§§ 28. 120.); and if it should occur independently of these states of vascular action, it may be admitted as a very likely means to excite these states, owing to the morbid or irritating properties possessed by it, especially when it is retained long in any of the cavities formed by these membranes; so that upon post mortem examination it may be difficult to determine, whether or no such inflammatory appearances as are found are actually the cause or the effect of the effusion: it is not improbable that they are in some measure both the one and the other. But it is not merely effusion into shut cavities which may follow upon obstruction of the urinary and cutaneous excretions after scarlatina, but a form of *congestive inflammation* of parenchymatous organs (§ 57.), characterised by more or less *œdema* or serous infiltration of the affected organ, may supervene, or this latter affection may be associated with serous effusion into the adjoining serous cavity — an association which is frequent, and although the extent of the internal lesion may escape detection during life, or the one part of the mischief may mask the other, examination after death discloses the combination. I have on several occasions found, on inspection of cases of this description, the lungs condensed more or less by the infiltration of a watery lymph, and serous effusion in both pleural cavities; and in other cases the substance of the brain vascular, watery, or œdematous, although there existed also serous effusion into the ventricles and between the membranes. These are amongst the chief lesions which destroy life after attacks of scarlatina, and are merely the remote effects of the arrest of the eliminating or depurating functions, to which I mputed so great importance many years since, in the articles on the BLOOD, DISEASE, FEVER, &c.

125. It is obvious that the *treatment* of these affections ought not to be directed to them only or chiefly, but to the pathological causes or states of which they are the effects — to the obstructions of the kidneys and skin. However much bloodletting may be indicated by the state of the pulse and other circumstances of the case, a chief dependence ought not to be placed on it, even when apparently most required, but other active agents should be brought into operation, more especially purgatives, the tepid or warm bath, medicated as above (§ 122.), terebinthinate epithems or embrocations over the loins or seat of local affection, after local depletions in either or both situations, and diaphoretics, followed by diuretics. These means are appropriate in the several sequelæ of scarlatina, the chief differences as respects either sequelæ being the extent to which each of them may be employed, and the succession in which they may be prescribed so as to obtain the greatest amount of benefit. After vascular depletions have been carried sufficiently far, dry-cupping will then be of service; and after terebinthinate epithems have been applied, oleaginous purgatives and enemata may be administered, containing spirit of turpentine in sufficient quantity to excite the organic functions, to restrain effusion, and to stimulate the kidneys. In most respects the treatment of the sequelæ of scarlatina is the same as that of the complications (§§ 114. *et seq.*); and it should be based on the same pathological and therapeutical principles.

126. (*d.*) I have noticed amongst the sequelæ of this malady, the *extension of disease to the ear*, to the *cervical vertebræ*, &c., to the *parotid glands*, the *surrounding cellular tissue* and *lymphatic glands*, &c. (§§ 46—48.), giving rise to more or less chronic disease of these parts; but it is unnecessary to add, at this place, any thing to what has been stated respecting these lesions in the articles CELLULAR TISSUE (§§ 34. *et seq.*), EAR (§§ 29. 30.), PARALYSIS (§§ 129. *et seq.*), PAROTIDS (15. *et seq.*), and SPINE. It has also been remarked that affections of the large, but more frequently of the small *joints* (§ 57.), or even of both, may occur at any period after the subsidence of the eruption; and that *erysipelas*, or even *gangrene* of an extremity may thus supervene. When the *joints* are affected, the synovial membranes are the chief parts implicated, and generally in consequence of the same pathological conditions as have been shown to originate with the emunctories; and these conditions, by contaminating the blood, affect these parts in an analogous manner to the affection of the serous membranes; and, in some instances, and in certain epidemics especially, give rise to severe pains, resembling those of gout or rheumatism of the joints. In these cases the treatment should not vary much from what has been advised for articular rheumatism or gout. Generally warm anodyne fomentations, or a combination of these with terebinthinate embrocations, and the use internally of the means already advised, and particularly of such as the state of the urinary excretion will suggest, are sufficient to remove this consecutive affection. If erysipelas, or either of its consequences should appear, the treatment for that disease ought to be adopted.

127. iii. REMARKS ON CERTAIN REMEDIES ADVISED FOR SCARLATINA. — After the full exposition of the *treatment* of the *several forms, complications*, and *sequelæ of scarlet fever*, which I have endeavoured to give, my remarks on this head will be brief, and be confined to those means which are most important. — (*a.*) *Bloodletting*, either general or local, or even both, have been recommended by BORSIERI, SCHRADER, GRUNDMANN, ARMSTRONG, CRAIGIE, and many others; but the impropriety of having recourse to it generally, or even frequently, in some epidemic prevalences of the malady, has been demonstrated by very numerous authorities. It would be improper to decide categorically either in favour or against the practice; for the character of the prevailing epidemic constitution, of the existing form or type of this fever, and the several circumstances of the case and of the patient, may render vascular depletion either most beneficial or most injurious. The propriety of the practice and the benefit resulting from it must necessarily depend upon the judgment of the physician, as respects not only the peculiarities of the case that especially require it, but also the extent to which it should be carried, and the period and mode in which it should be resorted to. If the practice be adopted suf-

ficiently early in the attack, and be aided by judicious means, *local bleeding* by cupping over the loins will be sufficient. A quantity of blood, as large as the exigencies of the case can require, may be taken in this way, and with a more decided effect as respects the organ which is most concerned in developing the most serious complications and symptoms of the malady, and in producing those changes which are usually termed malignant. In very young children a few leeches may be substituted, but the quantity taken by cupping is correctly ascertained, and hæmorrhage is prevented from being troublesome. The loss of blood in this way is also less felt, and less injurious than by venesection, in doubtful cases; and even when early employed in those cases or epidemics, which seem to contra-indicate the propriety of it, much less injury results from this mode than by any other.

128. (*b.*) *Emetics* have been strongly recommended by FOTHERGILL, WITHERING, STOLL, JOHNSTONE, CLARK, LENTIN, HUFELAND, and many others; but they have been unaccountably neglected in modern practice. I can assert that there is no remedy more generally appropriate — so suitable to all forms of the disease, if the substance be duly selected, and the periods of exhibition altogether proper. In most instances an emetic should be given as early as possible, and when given thus early, and before the type or character of the disease has fully declared itself, then ipecacuanha, or this with sulphate of zinc, may be preferred. When the disease is more fully developed, and assumes a sthenic or inflammatory character, then emetic tartar, or a combination of this with ipecacuanha may be prescribed, and cupping over the loins to an amount indicated by the symptoms and its effects may precede the emetic. When the disease presents malignant characters or manifest adynamia or putro-adynamia, then sulphate of zinc with capsicum, &c. may be preferred, and dry-cupping only be employed. An early recourse to emetics frequently prevents the occurrence of inflammatory symptoms on the one hand, and of malignancy on the other. But the exhibition of them, especially of the one last named, should not be confined to the earlier periods of the malady. The state of the throat, or the extension of disease to the larynx, may require a recourse to this practice oftener than once during the course of the disease; and in the low or advanced states of the malady the combination of the emetic, whether ipecacuanha or sulphate of zinc, with stimulants and hot spices, will be of advantage. When tartar emetic is prescribed as an emetic in divided doses for children in scarlatina, it sometimes fails of producing this effect, and if the exhibition of it be persisted in, even for a short time, it may produce dangerous or even fatal sinking, although the form of the disease may have been more than usually sthenic or inflammatory when it was first prescribed.

129. (*c.*) There are few remedies which require more judgment in their exhibition and selection in scarlatina than *purgatives* and *aperients*. For if they be given at the period of eruption, especially when the efflorescence is being evolved, they may interrupt the regular course of the disease; and if they be too long omitted, the retention of morbid secretions and excretions may be equally detrimental. If again they are of a too irritating kind they may develope an enteric complication, or, in the more asthenic forms, seriously depress or exhaust the patient. They are often exhibited with much benefit, as already advised (§§ 102. 165.), after an emetic has operated, when the patient is first attacked, and before the eruption begins to appear. After this period, or during the eruption, if the disease assumes a regular course, mild aperients, sufficient merely for the prevention of accumulations of the excretions, are only required. If, however, determinations to the head or suppressed function of the kidneys supervene, then the more active purgative, conjoined with calomel, terebinthinate enemata, &c. already mentioned, are of service. When the disease assumes an asthenic or malignant form, the purgatives should be conjoined with tonics, stimulants, and aromatics, as with cinchona, cascarilla, gentian, ammonia, spices, &c. In the more regular forms, purgatives are generally of greater service upon the disappearance than during the continuance of the eruption; and in every circumstance the combination with them of the alkaline carbonates or sub-carbonates is most beneficial. The indications for or against a recourse to purgatives, and the choice of them, depend upon the type, form, and complication of the disease, and upon the states of the alvine functions and evacuations, which ought to be always carefully examined.

130. (*d.*) Preparations of *cinchona* and other *tonics* have been much employed in the treatment of the malignant and asthenic scarlatina; and in these forms especially, after the exhibition of emetics and after morbid secretions and excretions have been duly evacuated, and after cupping or dry-cupping has been employed, in cases requiring either or both, these medicines are most beneficial; much, however, depending upon the selection and combination of them with other means. Vascular depletion early in the disease may be beneficial, and yet the exhibition of tonics may be imperatively required at a more advanced period. But a recourse to the latter should very much depend upon the state of the urinary function. Most of the earlier writers on the disease since the time of MORTON, and especially those who observed chiefly the more malignant types, have insisted much upon the necessity of recourse to *cinchona*, in the forms either of powder, decoction, or tincture, especially HUXHAM's tincture. But even in these types this medicine is best prescribed as just advised; and if the urine be suppressed, bloody, very scanty, and very high-coloured, cupping even in these ought to precede the administration of this remedy. In cases which suggest doubts of the propriety of having recourse to it, the infusion or decoction, conjoined with the liquor ammoniæ acetatis, with the acid or with the alkali in excess, or with nitrate of potash, according to the peculiarities of the case, and with spirit of nitric æther, will never be injurious, but most frequently very beneficial. When symptoms of malignancy are unequivocal, and the urine not suppressed, the decoction with the compound tincture of cinchona, or with tincture of serpentaria and carbonate of ammonia, and sometimes also with the bicarbonate of potash or soda, will be of service; or the mineral acids, especially the *hydrochloric*, or *nitro-hydrochloric acid*, with the æthers, may be given in the decoction of the cinchona when the urine indicates the

propriety of exhibiting these in preference to the alkaline carbonates. If the bark affect the bowels, the *cascarilla* or *willow bark* may be substituted, or *salicine* may be employed. Other tonics, or tonic febrifuge preparations, may be prescribed in mild cases; but in the malignant type, these just mentioned, or the sulphate of *quina* conjoined with camphor, and other substances noticed when treating of the malignant form of the malady (§§ 107. *et seq.*), are most deserving of adoption.

131. (*e.*) *Stimulants* are required in the asthenic forms of the disease, and often at an advanced stage of the more sthenic type, but generally in conjunction with other means. The *sesqui-carbonate of ammonia* was strongly recommended by PEART, and is certainly often most beneficial when combined, as above advised, according to the peculiarities of individual cases. It is frequently prescribed in too small and consequently in efficient doses; and the same remark applies to the *æthers* and their preparations. When a tonic and antiseptic effect is desired, ammonia should be conjoined with the preparations of cinchona and camphor; and when a diaphoretic action is indicated it should be given with the solution of the acetate of ammonia and spirit of nitric æther. The æthers are most useful when the patient complains of sinking faintness, or leipothymia. With quinine and compound infusion of roses, *sulphuric æther* may be preferred; and with the decoction of bark, and hydrochloric acid, or the nitro-hydrochloric acid, *hydrochloric æther* may be prescribed. The *chlorate of potash* may be conjoined with tonic infusions or decoctions, or with alkaline carbonates and æther; and in the more malignant states of the disease these medicines should be ordered in frequently repeated doses, and be further aided by *camphor*, *musk*, *serpentaria*, or *capsicum*. The combination of camphor with spirit of Mindereri was much confided in by HUFELAND in this class of cases. A recourse to *wine*, or even to *brandy*, in the forms mentioned above (§§ 109.), may not only be of service, but even indispensable, in the more asthenic and malignant states of the disease.

132. (*f.*) *Diaphoretics* and *diuretics* are medicines of great importance in this disease. The functions of the skin and kidneys are interrupted by the active vascular congestion, and by the alteration of the organic nervous influence of these parts, and therefore, whilst means are being used to equalize the circulation and to relax the cutaneous surface, medicines should be prescribed to aid these intentions, and to rouse the secreting and depurating actions of these organs. In the more sthenic or inflammatory types, and at the commencement of the disease, the antimonial diaphoretics, conjoined with the solution of the acetate of ammonia and spirit of nitric ether, or with nitrate of potash, will generally be of service, even although they may fail of materially promoting the functions in question. But, in other states of the malady, diaphoretics of a warm and restorative nature, or a combination of the more common diaphoretics with stimulants and antispasmodics, as with ammonia, the æther, &c. especially after the tepid or warm bath has been resorted to, will be found most beneficial.

133. *Diuretics* should be given in similar combinations to those now advised, in the asthenic or malignant form of scarlatina; but in this form, and in the advanced stages more especially, the most certain diuretic is the spirit of turpentine administered in an enema, or the terebinthinate epithem or embrocation applied over the loins, as already mentioned. During desquamation, when the kidneys are frequently congested or the tubuli obstructed by the desquamated epithelium, the supertartrate of potash and biborate of soda, or the acetate or citrate of potash with either the acid or the alkaline carbonate in excess, or any of the saline diuretics, or others mentioned in the article DROPSY (§ 135. *et seq.*), when describing the treatment of *anasarca*, will be appropriate.

134. (*g.*) Besides the above, *various means* have been recommended by writers, in the treatment of scarlatina, as either empirical remedies or as antiseptics and stimulants. The most serviceable of these, when judiciously employed, are the mineral acids, the alkalies, and certain vegetable acids and products. Of the *mineral acids*, the most beneficial are the hydrochloric and the nitro-hydrochloric, either in simple dilution, or conjoined with the decoction, or infusion of cinchona, or with camphor, or with these and the hydrochloric æther. Of the vegetable acids, the *acetic* and the *citric* are the most useful. The former has been frequently employed both internally and externally, since the earliest irruptions of the malady in an epidemic form, chiefly on account of its antiseptic property; and with reference to this virtue I have often employed it; but more recently I have preferred the *pyroligneous acetic acid*, either combined as above, or given with creasote, or other antiseptic agents, in the more malignant states of the disease. *Citric acid* is also beneficial in similar circumstances; but whilst I have considered it as preferable to the common acetic acid, I have believed it inferior to the pyroligneous. Either of these acids is often beneficial; but the vegetable acids now recommended should be given more liberally than they usually are.

135. *Chlorine* and the *chlorides* are also very excellent remedies in the more malignant states and advanced stages of scarlatina, their influence being aided by other restorative means, as cinchona, serpentaria, camphor, musk, capsicum, &c. *Chlorine* was first prescribed by BRATTHWAITE; and its excellent effects in the more malignant states of the disease have been acknowledged by many British and foreign authorities. The *chlorine-water*, of the Dublin Pharmacopœia, may be given in doses suitable to the age of the patient, in camphor mixture, or in any other proper vehicle. *Alkaline carbonates*, both the volatile and the fixed, have been recommended by many authorities in scarlatina. They may be prescribed with the remedies just named, and in the states of the disease, and in the combinations mentioned above (§ 108.). *Nitrate of potash*, in full and frequent doses, has been advised by FRUNK; and it is often of service when associated with other means which are appropriate to the peculiarities of the case, more especially with camphor and others already noticed. The use of *colchicum* has recently been recommended; but it is a hazardous agent even in the more sthenic forms of the malady, as its injurious operation is liable to be confounded with the unfavourable course of the disease. It should be given only in similar states and circumstances of the case to

those for which I have admitted that the tartrate of antimony may be prescribed.

136. (*h.*) *Gargles*, or, preferable to these, stimulating *lotions* or *washes*, with a strong solution of the *nitrate of silver*, or of powdered *alum* in the pyroligenous acid, are often extremely beneficial, when employed early in the anginous form of the malady, especially when the affection of the throat assumes an asthenic, malignant, or offensive character. Either of these solutions, or others already mentioned (§§ 109.), should be applied early by means of a camel's-hair brush, or of sponge, in the manner already pointed out; and the solution should be strong in proportion to the malignancy of the affection. At the same time as these means are being used, the external applications to the throat, about to be noticed (§ 140.), should be resorted to, and the tonic, restorative, and antiseptic medicines, mentioned above, ought to be administered. A strong solution of the *bichloride of Mercury* has been recommended by Dr. SAUTER to be used as a gargle in the more asthenic affection of the throat; and, judging from my experience of it as a gargle in analogous affections of this part, it is very likely to prove of service. In some of the more prolonged cases, and when the tonsils are much enlarged, I have directed the parts to be pencilled with the *tincture of Iodine*, and if there be, as often observed, much external swelling, after the eruption has disappeared, I have prescribed the same application externally. In less malignant cases, the chloro-sodaic solution of LABARRAQUE in the proportion of an ounce to five of camphor water and half an ounce of honey, is a very useful gargle; or the decoction of contrayerva with hydrochloric acid and tincture of capsicum; or a filtered solution of the confection of roses with the same acid and tincture, or the tincture of myrrh, and camphorated spirit, may be employed in still less severe forms of the disease.

137. (*i.*) *Cold*, in various modes of application, has been resorted to for the removal of the pungent heat of the surface, which is believed to increase not only the distress of the patient, but also the vascular action and the exhaustion of organic nervous power. It may always be safely applied when the skin is very hot and dry. Various modes of employing it have been advised. BEDDOES directed a free current of *cold air* to pass over the patient. But in resorting to this mode of reducing the temperature of the surface, the respiratory passages and organs may suffer, and the complications described above, especially bronchitis, pneumonia, pleuritis, or peritonitis may be thereby occasioned; or the eruption may be suppressed. The obvious benefit resulting from treating the patient in a large airy apartment, where the temperature is cool, rather than very cold, and in which the air is being continually renewed, should never be overlooked; and the bed and bed-clothing ought to be cool and light, especially during the eruptive stages: but subsequently both the one and the other ought to be so regulated as to favour the restoration of the cutaneous functions, and to equalize the due distribution of the blood.

138. The *affusion of cold water* over the surface of patients in scarlatina, so strenuously advised by Dr. CURRIE, and so generally and indiscriminately practised during the commencement of this century, has been found beneficial early in the more sthenic and regular forms of the disease. But an injudicious recourse to this practice in asthenic, malignant, and complicated cases, has brought it into disrepute. In the hands, however, of a discriminating physician — of one capable of interpreting aright existing pathological states, and of selecting and applying judiciously medicinal agents for the removal of these states — the cold affusion is still deserving of estimation. I have, however, preferred in most circumstances, *cold* or *tepid sponging* of the surface, adapting the temperature, and the fluids employed, to the peculiarities of the case — *cold* or *cool fluids* at an early stage and in sthenic cases, and *tepid*, or even *warm fluids*, at an advanced period, and in the asthenic or malignant forms, whenever the skin is hot and dry. These are in many respects preferable to affusion, for they may be more frequently resorted to, and may be employed for a longer time, without exhausting the patient. The fluids which may be selected for this purpose deserve some notice. I have usually directed equal parts of vinegar and water, or of spirit of Minderrie and water, or camphor water, during the early stages; but have subsequently employed a weak alkaline solution, or a solution of borax, as being more likely to facilitate the restoration of the functions of the skin, during the advanced stages, and to prevent the affection of the kidneys and the dropsy often supervening as sequelæ of the disease. Frequent sponging of the surface with a solution of the *nitro-hydrochloric* acids, of a tepid or warm temperature, according to the state of the case, will be found of much service in the malignant and asthenic forms of the malady.

139. (*i.*) *Baths, tepid* or *warm*, according to the period of the disease and the peculiarities of the case, are often beneficial. The tepid bath in the earlier stages, generally lowers the heat of the skin, mitigates the uneasiness and burning attending the eruption, and relaxes the surface. When the disease is further advanced, especially if it be complicated, then the *warm bath* may be preferred; and when the eruption has suddenly or prematurely disappeared, salt and mustard may be added to the water. If a warm bath be required during desquamation, or if any of the sequelæ of the disease supervene, the alkaline sub-carbonates, or the biborate of soda, will be a very useful addition; and if the complication be of a very serious character, mustard may be added. A frequent recourse to warm baths, during desquamation, will generally prevent the sequelæ of scarlatina, especially if the alkaline additions just mentioned be made to the baths.

140. (*k.*) *Embrocations* and *external applications* of various kinds have been employed; but they are required chiefly for the severer states, and internal complications of the malady; or when the eruption either does not come out, or prematurely disappears. *Blisters* are most hazardous applications for children in this disease, and are generally so in proportion to their youth. In the mild and regular forms they are not required, and in the malignant or complicated may produce gangrene of the part. They are sometimes of service in adults, especially at an advanced stage, and when due reference is made to the state of the urine. *Mustard poultices* are often of use in the circumstances just mentioned; but in the more malignant type of the disease, in very young subjects, they

pancies, opposite views, apparent differences, contradictory assertions, &c. — to attain greater precision of observation and description, unbiassed by hypothesis or hastily formed opinion.

4. All the forms of cancer were, up to an early period of the present century, limited to — 1st. Scirrho-cancer and Carcinoma; and 2d. to Fungus Hæmatodes, or Hæmato-fungoid disease. To these were successively added, 3d. Encephaloma; 4th. Colloid disease, and 5th. Melanosis. Encephaloma, or encephaloid tissue, and hæmato-fungoid disease are evidently identical; the former being a more remarkable development of the brain or milt-like production than the latter, which presents, with more or less of this production, a much more remarkable state of abnormal vascular development. Colloid formation has greater claims to the rank of a variety of scirrho-cancer, although it is often associated with, or approximates to, the scirrhous structure. Melanosis should be viewed as a distinct formation; and not more intimately connected with true cancer than are tubercles. Amongst the earliest investigators of the microscopic structure of scirrho-cancer, MÜLLER is most deserving of mention. In his work he divides scirrho-cancroid growths into the following varieties:—1st. Carcinoma fibrosum seu simplex;—2d. Carcinoma reticulare; — 3d. Carcinoma alveolare; — 4th. Carcinoma melanodes; — 5th. Carcinoma medullare; — 6th. Carcinoma hyalinum seu fasciculatum. VOGEL reduced the varieties to *four*: — 1st. Cellular cancer; — 2d. Fibrous cancer; — 3d. Melanotic cancer; — and 4th. Colloid cancer. GLUGE distinguishes only *three* forms: — 1st. Fungus medularis; — 2d. Scirrhus; — and 3d. Cancerous ulcer. Dr. WALSHE, and more recently professor BENNETT, consider that there are only three forms of cancer, properly so called, namely, (*a.*) Scirrhus, or hard; (*b.*) Encephaloma, or soft; and (*c.*) Colloid or jelly-like cancer. All the forms mentioned by morbid anatomists may, they think, be readily comprised under one or other of these heads.

5. Professor BENNETT remarks, that "when we endeavour to define what a cancerous growth really is, according to the description of morbid anatomists, or the symptoms of medical practitioners, we are at once thrown into a crowd of inconsistencies, from which the sooner we emancipate ourselves the better. This can be only done by attaching the term cancer to some characteristic structure. LEBERT has endeavoured to do this, and to establish that the existence of the *cancer-cell* is pathognomonic; that it may be distinguished from every other kind of cell formation, and at once indicates the nature of a cancerous growth." But Dr. BENNETT adds, that the numerous observations which he has made obliges him to differ from M. LEBERT, and rather to agree with MÜLLER in thinking that no single element is diagnostic of scirrho-cancer. The circumstance that no individual element is characteristic of cancer led MÜLLER to maintain that there is no histological difference between it and healthy textures. This also induced VIRCHOW to coincide with him in the opinion, that "carcinoma is no heterologous tissue, and its finer parts are not essentially different from the tissues of benignant textures and the primitive tissues of the embryo." If this be true, much indeed, nearly all that I have to add, under this head, to what I have already written on scirrho-cancer, or malignant growths, may be spared; and I might join Dr. WATSON in remarking that "microscopic observers say, that, in their minute and original structure, there is no perceptible distinction between the most innocent and the most malignant growths; nay, that both agree in their primary corpuscular elements with the healthy tissues of animals and even of plants. This very agreement, if it really be so complete, shows that in *classifying* morbid growths, we must reject the aid of the microscope, and attend to their proper and more palpable features." — (*Princip. and Pract. of Physic.* 3d Edit. vol. i. p. 217.)

6. But the "Histologists" aver, that the microscope alone can furnish the diagnosis and the basis of classification, and it alone; and as they include in their ranks illustrious names, notwithstanding equally illustrious dissentients, it is due to them to hear their statements and weigh their arguments. Professor BENNETT observes, that "this dispute as to whether a cancerous growth be heterologous or homologous (LAENNEC), heteromorphous or homorphous (LEBERT), arises from two modes of viewing the subject. If any one individual element be chosen as the test of comparison, then it does not essentially differ from others existing in healthy tissues, and the structure is *not* heterologous; but if several be chosen, and their relation to each other studied, then they differ from those in normal textures, and they *are* heterologous." (*Op. cit.* p. 171.) VOGEL says, that "our diagnosis must be based, not so much on the coarser physical characters, which in cancer are liable to extreme variations, as on the histological relations as viewed through the microscope." Before, however, the consideration of the distinctions which histologists believe may be drawn by means of the more powerful microscopes, it will be necessary, in the *first place*, to take a view of the *elements* assigned by them as entering into the structure of scirrho-cancer and morbid growths. According to Professor BENNETT, the latest writer on morbid structures of a scirrho-cancerous and cancroid nature, the following elementary forms enter into their composition: — 1st. Molecules and granules; — 2d. Naked nuclei; — 3d. Cells of various kinds; — 4th. Filaments or fibres; — 5th. Blood-vessels; — 6th. Crystals. These he considers as the elements of all morbid products. And agreeably with his own researches and with those of several other observers, he states that there is not any thing characteristic of cancer in either of these elements when viewed alone; and that it is only in relation to each other that they become important. — In this article I shall consider the elementary structure of both SCIRRHO-CANCEROUS and CANCROID GROWTHS — of both MALIGNANT and NON-MALIGNANT TUMOURS; and shall follow the arrangement and researches of Professor BENNETT.

7. I. ELEMENTS OF MORBID GROWTHS. — i. MOLECULES and GRANULES are described by Dr. BENNETT as varieties of the same form. A *molecule* he defines to be a minute body presenting no determinate edge or internal centre; a *granule*, a body which varies in size, and is distinguished by a distinct margin, the external edge of which is abrupt. When transparent, granules refract light and present a bright or dark centre, according to the

focal point in which they are viewed. A molecule may become a granule under a greater magnifying power, and the latter appears as the former under a less power; so that there is actually no real distinction between these two organic elements. These bodies seem to vary in composition. They may consist of various kinds of fat, and disappear on the addition of potash or ether; or they may be albuminous, and be partly dissolved by acetic acid; or partly fatty and partly albuminous; or they may consist of pigmentary or mineral matter. A granule may be so large as to be called a globule; such as the bodies found in milk. Molecules and granules differ in shape; in general they are spherical, but they are sometimes more or less angular; they may be isolated, or grouped, forming granular masses; they may exist alone, or be mixed with other elementary forms. Dr. BENNETT considers them the most universal element in tissues, and of the greatest importance in their indications of the nature of structure.

8. These bodies appear to be formed *primarily* by precipitation, and *secondarily* by disintegration. The *primary* change in the germinating seed or ovum is the gradual appearance, in a transparent fluid, of numerous molecules and granules, which, by coalescing or enlarging, are gradually changed into more compound structures. The *secondary* formation is when a structure decays, and gradually breaks down into an organic or animal debris; this is resolved into granules and molecules, which are ultimately reduced to a fluid state and are absorbed. Thus there may be granules of evolution and granules of disintegration. (BENNETT.) Molecules and granules have distinct movements of their own; they turn round in a liquid with a tremulous movement. In the interior of cells these movements are often well marked, and very regular. "When we magnify a salivary globule 600 or 800 diameters linear, we can see the minute granular contents in a state of continual vibration, or revolving in circles of extreme minuteness. In certain vegetable cells these circles are enlarged so as to constitute a visible circulation. We frequently find molecules and granules encrusting or attached to larger globules, and they, doubtless, occasionally serve to assist the progress of development. Sometimes they are attached together in masses, at others repelled and kept isolated. Similar facts may be observed wherever minute solid particles are seen floating in fluids, which prove that the movements of the minutest molecules are governed by laws as definite and fixed as those which rule the planets revolving in space.

9. "Molecules and granules may be produced mechanically, and are thus capable of being subjected to the same laws as those which are formed naturally. Thus, the pigmentary and mineral granules precipitated by the chemist are identical with those precipitated in living fluids. Again, when transparent oil and transparent albumen are brought into contact, a precipitation in a membranous form takes place at the point of union. Thus, a drop of oil cannot for a moment be surrounded by an albuminous fluid, without its being inclosed in a vesicular membrane or cell. Rubbing the two drops of oil and albumen together resolves them into granules composed of a minute particle of the one surrounded by a thin film of the other, which granules are identical with those found in animal fluids. Now, when it is remembered that oil and albumen pervade all organised bodies, that they are continually coming in contact, and that membranes and cells must thereby be necessarily produced; moreover, as the other soluble elements which enter into organised structures must communicate to the fluids various kinds of densities,—it will be clear that all the physical conditions necessary for endosmosis and exosmosis must be present. When, in addition, it is considered that modern anatomy and physiology have demonstrated that all organised structures consist of granules, nuclei, and cells, composed, in like manner, of a membranous envelope, and endowed more or less with the same physical properties, the importance of these facts must be recognised." (p. 140, 141.)

10. Professor BENNETT considers it in the highest degree probable that all blastemata—(*blastema* or *cytoblastema*, or the *amorphous plasma*, which gives origin to cells or organised formations; see art. PUS, § 2.)—containing the necessary nutritive principles in solution, precipitate minute oily particles, which are the elementary granules of histologists. These, either separately or united, constitute nuclei composed of oil, surrounded by an albuminous membrane. In this condition they become subject to the physical law of endosmosis and exosmosis, and absorb or exude materials, according to the circumstances in which they are placed, and the unknown vital power to which they are subjected. "It must always be remembered that the granules produced mechanically by the union of oil and albumen, are not vital structures; but when formed in the animal body, under certain conditions, they become so. The physical relations pointed out are only necessary preliminary steps for the addition of that unknown force we call vitality, which directs the ultimate form these structures assume. They are a *sine qua non*, without which vitality cannot be called into existence. The different cells entering into the composition of the tissues are not formed from them directly as ASCHERSON supposed, but are the result of a series of physical and vital changes occurring in the elementary granules and nuclei, which, however, are themselves produced in the manner he pointed out." (p. 141, 142.) Instead, however, of saying that the physical conditions or relations here adverted to "are a *sine qua non* without which vitality cannot be called into existence," it would be more correct to say, that they are the simplest and the earliest material or physical entities with which vitality is allied, and that, with the agency, or under the influence of this alliance, they are capable of passing through a series of changes of a more and more complex kind;—that, although vitality could not be manifested without such material entities or alliances, in their earliest as well as in their progressively advanced states, the development and preservation of these states are entirely owing to the vitality with which such material entities are endowed from their earliest periods, and in their simplest forms, of existence. Dr. BENNETT concludes, that the above considerations lead to a generalisation that is of some importance, namely, that the molecular element is the real basis of all the tissues, and not the cell, as maintained by SCHWANN, or the nucleus, as is contended for by HENLE; for no cells are formed without nuclei, and no nuclei without granules; and it is a know-

ledge of the laws regulating the deposition of the latter in an exudation, and within nuclei and cells, that must guide us to a rational therapeutics, so far as the diseases of nutrition are concerned.

11. ii. NAKED NUCLEI. — Nuclei may be formed, according to Professor BENNETT, *primarily* and *secondarily*. — 1st. By the aggregation or confluence of molecules and granules, upon which a cell-wall is afterwards formed, "during the transformations of which the nucleus may remain permanently, may undergo a species of development, or completely disappear." — 2d. The original nucleus may expand and form the outer cell-wall, and another nucleus may be produced within it, also by the deposition and confluence of granules, which, by division, or the formation of other internal nucleoli, produce new nuclei and cells. "In either of these cases, occurring in healthy or morbid tissues, we may observe the nuclei of cells in all stages of their growth, and can have little doubt as to the progressive steps of their production." Dr. BENNETT considers that the nuclei formed in scirrho-cancerous and cancroid growths are produced in the same way as similar bodies in other textures; and that, when seen in well-formed cancer-cells, they are for the most part secondary — that is, formed subsequently to the cell-wall which incloses them. He has, however, often found numerous naked nuclei mingled with the fibrous stroma. In some of these, doubtless, their occurrence is explained by the breaking down and disappearance of the cell-walls, which at one time inclosed them. In this manner *free nuclei* occur secondarily, and are the result of disintegration; but, at other times, they are undoubtedly a primary formation, existing in an advancing, and not in a retrogressive growth, and are then often unconnected with cells. Whether free nuclei are ever capable of producing similar bodies, as BRUCH believes, without the agency of cells, is very doubtful. But Dr. BENNETT considers them in no way necessarily connected with cancerous growths. In some instances they are associated with fusiform corpuscles; and are observed either to be identical in form and appearance with their nuclei, or as elongating to constitute that corpuscle itself—a transformation rendered very probable by their appearances in several cases. "The true signification of these free nuclei is in some instances difficult to determine; for, whilst we may occasionally with M. LEBERT consider them as fibro-plastic, in progress of development into fibres, and at other times the remains of broken-down cells, the result of disintegration, there are other instances where the growth is advancing, and where there are no evidences to warrant either of these explanations." If they be connected with the fibrous element, it is easy to conceive that any of them remaining in a tissue may cause the return of a swelling in the cicatrix, or in the situation of a former tumour. But Dr. BENNETT is unacquainted with any fact which proves that a growth consisting of great multitudes of free nuclei among the fibrous stroma ever possesses the power of spreading to other tissues, as is the case with cancer. "It is therefore probable, that as granules, which are in many respects identical, may be transformed into the nuclei of different textures; so nuclei, which are alike, may be connected with fibres, or with various kinds of cells. Of the laws regulating these transformations we are ignorant; but as there are no granules distinctive of cancer-nucleoli, so there are no nuclei distinctive of cancer-cells. Moreover, the observations alluded to show the necessity of considering nuclei as bodies distinct from cells. They may occur alone with fibres, producing a texture which may be called fibro-nucleated." KÖLLIKER and HENLE have described the occurrence of diaphanous bodies floating among various tissues. Dr. BENNETT has frequently seen these not only in cancerous and cancroid growths, but also in a variety of morbid products, and in the fluid squeezed from the lungs in catarrh and from other œdematous tissues. He thinks that they may present a certain stage in the development of the nucleus, but that they are more probably nuclei enlarged by the endosmosis of fluid, a view which is favoured by the fact of their frequency in textures which are softened or infiltrated with serum.

12. iii. CELLS. — Professor BENNETT states that there is no kind of cell-formation which, at all times and under all circumstances, is capable of being distinguished from every other form of cell-growth. Nevertheless, very characteristic differences may exist among cells, the study of which is of the greatest service in distinguishing one tissue from another. These differences principally depend upon the age or state of development, the situation in which the cells are formed, and a variety of concomitant circumstances, all of which should be taken into account before an accurate opinion as to their nature can be formed. The different kinds of cell which Dr. BENNETT has observed in scirrho-cancerous and cancroid growths are — 1st, The cancer-cell; — 2d, Epithelial-cell; — 3d, Cartilage-cell; — 4th, Compound granular-cell; — 5th, Fibro-plastic and fusiform-cell; — 6th, Pus-cell. These names he admits to be open to objection, but he has none other to substitute for them. One viewed by itself is often not to be distinguished from another. It is only when occurring in groups, or examined in relation to surrounding textures, that these terms becomes significative. An exact appreciation of each is of the utmost importance in the microscopic study of morbid growths.

13. *A. Cancer-cell.* — Dr. BENNETT's description of this cell is the most elaborate. He states that it exists under numerous forms, presents very different appearances at different times, and is of variable size. In form it is either round, oval, caudate, spindle-shaped, oblong, square, heart-shaped, or of various forms, from pressure on its sides. The external edge is generally sharp and well-defined on the field of the microscope. It varies in size from 1-100th to the 1-10th of a millimetre in diameter; the former size occurring in a very early stage of its development, the latter when the cell is old, and contains other cells. It is most commonly 1-50th to 1-30th of a millimetre in diameter. The cell is destitute of colour, except in melanotic cancer, when the pigment-granules it contains tinge it of a light or dark bistre brown, passing into deep black. The cell-wall, when young, is smooth and distended; when old, it is more or less corrugated and flaccid. Its contents are various. There is always one nucleus, often two, and sometimes from three to nine. Most frequently there is only one, which is round or oval, generally the latter, and

contains one or two granules or nucleoli. The nucleus, like the cell itself, varies in size, and may occupy from 1-6th to 4-5ths of its volume. Between the nucleus and cell-wall there is a colourless liquid, which, at first transparent, becomes afterwards opalescent, from the presence of molecules and granules. On the addition of water, the cell-wall becomes distended by endosmosis, and is enlarged. Syrup and thick mucilage cause it to shrink and contract by exosmosis. The addition of acetic acid renders the cell-wall more transparent, and dissolves the young cells; whilst the nucleus either is unaffected, or its margin becomes thicker, and its substance more contracted. Liquor potassæ reduces the whole to an amorphous mass.

14. The mode in which the cancer-cell is developed offers, in the opinion of Dr. BENNETT, one of the best examples of the endogenous growth and multiplication of cell within cell. At first, numerous molecules and granules are formed in the semifluid or solid blastema, several of them coalescing to constitute a nucleus, which assumes an oval or round form. On this a cell-wall arises, and gradually enlarges, apparently formed either by the confluence of molecules attracted to the nucleus, or by the expansion of the nuclear wall. In either case, the cell-wall enlarges and separates itself from the nucleus by the endosmosis or assimilation of fluid from the surrounding blastema. Another nucleus may now often be observed arising within the cell-wall, first assuming the form of a granule, which gradually enlarges until it presents the same form and size as the former one. Double nucleated cells are very common. Within each nucleus may now also be seen one or two nucleoli, which sometimes form very early and hold the same relation to the nucleus as the nucleus does to the cell. One or both nuclei now enlarge: the nucleoli also increase in size, and not infrequently within these latter other granules may be seen, forming and enlarging in their turn. "As the included nuclei grow and become transformed into cells, the original cell-wall becomes gradually atrophied, and dissolves or breaks down into granules of disintegration; but in cases where the growth is rapid it expands, and constitutes what has been called a mother-cell, within which several cells, nuclei and nucleoli, may be seen in various stages of development. More commonly they dissolve or break down before arriving at this, and their progress is often checked by the formation between the nucleus and cell-wall of numerous fatty molecules and granules, which at length fill up the cell, press upon the nucleus, and render it abortive." This constitutes one of the modes in which the so-called compound granular cell is produced.

15. As the cell-wall becomes older, it seems to thicken, and to be less readily affected by reagents. VOGEL says that the thick cell-wall may assume a fibrous character. Dr. BENNETT has never seen this, nor any appearance of cancer cells being developed into fibres. These cells may become caudate, elongated, and throw out pointed prolongations, but they do not split up into filaments. It is probable that fusiform or epithelial cells have been mistaken for them. Nor does Dr. BENNETT agree with KÜSS in supposing that the mother cells may split into smaller segments, and so multiply by division. It is probable that cells impacted in masses of coagulated blastema have been mistaken for compound cells, owing to their close resemblance. BRUCH considers that secondary cells form within the parent one not only endogenously, but by the division of the nucleus; and supports this opinion by numerous known facts in the development of embryonal cells and of plants, in which the nucleus is seen dividing in various ways: but he denies that the cell-wall itself ever thus divides.

16. The *cause* of the cancer-cell varying in size, appearance, and structure, according to Dr. BENNETT, is the arrest of the process of development at different stages. It is, he supposes, with a simple cell as with the most highly organised plant or animal. It may perish at birth, infancy, youth, or maturity, while comparatively few arrive at old age. The situation and the amount of exudation or blastema thrown out also influences their number, form, and size; while the degree of pressure to which they are subjected produces a similar result.

17. Is the cancer-cell a *new substance*, or is it only a modification of cells pre-existing in the body? Dr. BENNETT states, that examined by itself, there is no possibility of distinguishing a cancer-cell from many epithelial, cartilage, or embryonal cells. "When, therefore, a cancerous growth involves a mucous membrane, the skin or bone, it may be maintained that the cells contained in it are only excessive multiplications of normal structures. When the universality of mucous membranes is considered, how they line all hollow viscera, and permeate the various glands in which cancer is common, the difficulty of disproving such a view becomes very great." In the liver also, the hepatic cells may be confounded with those of cancer in certain stages of their development; and it may be asked whether, in this situation, the morbid cells are not altered normal ones. This question, then, can only be solved by paying attention to a series of observations; and Dr. BENNETT thinks, that those which he has detailed are sufficiently numerous and varied to prove the following:—1st. That the cancerous originates in the same nervous and vascular disturbances as the other forms of exudation.—2d. That cancer-cells, in whatever tissue they may be found, whether glandular, areolar, osseous, &c. present the same characters; and—3d. That cancer may be actually seen to arise in tissues altogether separate from epithelium or cartilage. "It may be doubted whether the true cancer-cell be ever formed by transformation of a previously existing one. On the other hand, the epithelial and cartilage-cell may assume all the characters of that found in cancer, but a detection of their normal or anormal origin constitutes one of the distinctions between cancerous and cancroid growths."—(*Op. cit.* p. 149.) It is manifest from the foregoing that "Histology" throws but a faint light upon the diagnosis of the several forms of scirrho-cancer. But it may be interesting to know what one of the ablest and most zealous histologists further states respecting other cells found in morbid and in healthy structures.

18. *B. Epithelial cells.*—The different forms of epithelial or epidermic cells, and the mode of their formation, appear to be much the same

in morbid as in healthy tissues. Dr. BENNETT states that young plastic epithelial cells, when isolated and viewed by themselves, present all the physical characters of cancer-cells, especially when they have been lying for some time in a fluid, as often observed in the air-vesicles of the lungs, in the ventricles of the brain, or in the mucous coat of the bladder. When studied, however, in mass, nothing can be more easy than to distinguish them. They have a disposition to run together in groups, and to adhere at their edges; they are of tolerably uniform size. Cancer-cells, on the other hand, never exhibit a tendency to coalesce, but are for the most part separated by a greater or less quantity of molecular and granular matter, either disintegrated, or aggregated together: they vary greatly in size. As epithelial cells become older, their dissimilarity from cancer-cells becomes greater; they are then flatter, and resemble scales. They are also more opaque, and more resistant to the action of acetic acid. When epithelial cells constitute the principal portion of a morbid growth, such as corns, warts, scaly eruptions, &c. they become greatly compressed together, those external presenting a series of superimposed laminæ, whilst the deeper are round, oval, spindle-shaped, or more or less altered in form, or sometimes united into a firm growth, by pressure. "Occasionally such growths soften and ulcerate at their summit, especially on mucous membranes, when the superficial cells imbibe moisture, enlarge, and occasionally again present many of the characters of cancer-cells.

19. *C. Cartilage-cell.*—Dr. BENNETT states, that many young cartilage-cells present the physical characters of cancer-cells, and are similarly developed, so that at an advanced stage they resemble, with their included cells and nuclei, mother cancer-cells. They may, however, be distinguished in healthy adult articular cartilage, by the hyaline solid blastema in which they are imbedded; and by the great distinctness of their margins and the high refractive power of their nuclei. Even in diseased states of articular cartilages, the cells of this structure may be distinguished from cancer-cells, by the presence of some of the former in a healthy state, although the majority of them become more or less opaque, from the deposition of molecular matter, and from the cells becoming partly or wholly filled with fatty granules.

20. The cells in *morbid cartilaginous growths* are large, and according to MÜLLER more resemble those of the embryonal, than of the adult tissues. These cells, when they become separated by disintegration of the hyaline substance, as observed in softened enchondromatous growth, pass more or less from the normal type, and resemble cancer-cells. In these cases the solid hyaline blastema breaks down into a molecular fluid, the cells are liberated, become enlarged, and float in it, together with broken up fragments of the fibrous structure, should any have existed. Water and acetic acid produce different effects upon these from those occasioned on cancer-cells.

21. *D. Fibro-plastic and Fusiform cell.*—M. LEBERT describes under this term a peculiar round or oval corpuscle, with a small nucleus, which has a tendency to elongate at both extremities, and to be transformed into fibres. Dr. BENNETT has met with these in all stages of their development, even in cancerous and cancroid growths; but very often also in tissues and under circumstances unconnected with cancer, as in gelatinous polypus, and in the coagulated exudation from inflamed serous surfaces. From this he concludes, that fibro-plastic corpuscles are formed independently of all cancerous complication, and that cells so produced have the power, as stated by SCHWANN, of developing themselves into fibres. MÜLLER remarks that "the caudate corpuscles are by no means peculiar to fungus medullaris: they may, indeed, often be observed in its substance, but they frequently do not exist in it, while they are as often met with in non-carcinomatous as in medullary growths." He adds, that they probably depend only on the transformation of cells into fibres, and are consequently merely fibres in an early stage of development. Both LEBERT and BENNETT conclude, that the round or oval fibro-plastic cell, by elongation on one or both sides, become caudate, spindle-shaped, and at length fusiform; and that "after a time, fusiform corpuscles, by being aggregated and compressed together, may produce a fibrous texture of considerable density, and by subsequently splitting up into fibres, occasion a true filamentous or densely fibrous tissue." Dr. BENNETT adds, that the fibro-plastic cell may so resemble the young cancer and epithelial cell as not to be distinguished from either when viewed alone; but, by observing the form and character of the structures associated with it, and paying attention to the concomitant circumstances, it may in general be recognised.

22. *E. Compound granular cell.*—This cell is common in all morbid growths, and is frequently present in all the forms of cancer. It is round or oval, with a nucleus sometimes visible, at other times not. This cell varies from the 1-50th to 1-35th of a millimetre in diameter, or even still more. It sometimes contains a few granules only, at others it is so completely filled with them as to assume a brownish or dark appearance. Water produces no change in this cell, but acetic acid sometimes renders the cell-wall more transparent. Compound granular cells are soluble in ether, and break down into a molecular mass on the addition of potash and ammonia. On gradually pressing these cells by a compressor, large drops, like those of oil, sometimes appear within the cell-wall, or exude through it. The cell-wall may be ruptured by friction, and its contents dispersed.

23. The *development* of these cells has been watched by Dr. BENNETT in all forms of morbid products, and especially in the softenings occurring in nervous centres. There it may be observed that the exudation first coagulates in minute molecules and granules, among which larger, colourless, transparent bodies are soon perceived. These are nuclei, upon which a cell-wall arises. Granules, nuclei, and cells may frequently be seen in all their stages of development, coating or encrusting the vessels externally. The granules are generally formed in the cell, between the nucleus and its wall. These become more and more numerous, until at length the nucleus is observed, and the whole cell appears full and distended with them. The cell-wall is now dissolved, and its contents escape. Conjoined with this cell, masses of granules are often seen cohering together, of various shapes, and not surrounded by any membrane. These masses sometimes arise from the

solution of the cell-wall, or consist of portions of the coagulated exudation, frequently seen to break, and peel off from the vessels. The cells and masses now described are found in the exudative softening of parenchymatous organs, on the surface of granulations and pyogenic membranes, in the colostrum, accompanying pus corpuscles, and combined with cancerous, tubercular, encysted, and all other kinds of morbid growths. They were first described by GLUGE, who called them "inflammation-globules." VOGEL termed them "granular cells;" and Dr. BENNETT first called them "exudation corpuscles;" but afterwards "compound granular cells," as involving no theory.

24. The true *nature* of these cells has been variously viewed. They were long considered to indicate the existence of inflammation, and their presence in various kinds of exudation supported the opinion; but BENNETT states, that the recent researches of REINHARDT and VIRCHOW have shown that there is no form of cell-growth which, under certain conditions, may not exhibit numerous fatty granules in its interior, and resemble the different stages of the compound granular cell. In this manner epithelial, cartilage, hepatic, pus, cancer, and indeed every other cell, may be transformed into the compound granular cell, by exactly the same series of changes as are above described. These observers consider that the frequency of this form of cell in so many kinds of morbid growth, and in such various textures and fluids, is not so much evidence of exudation as of the fatty degeneration of all cell formations: and they further point out this fatty transformation as sometimes commencing in the nucleus, or even in the nucleolus when it is enlarged — a fact which explains many of the appearances observed in scirrho-cancerous and cancroid and other growths.

25. *F. Pus-cell.* — In the article PUS I have described the *Pus-cell*, according to VOGEL. *Pus* consists of numerous corpuscles floating in a clear fluid—*liquor puris*. These corpuscles are perfectly globular, and vary from 1-100th to 1-75th of a millimetre in diameter. Their surface is finely granular. They have a regular, defined edge, and roll freely in the liquor puris upon each other. The addition of water increases their size, their finely granulated surface disappears, and they become more transparent. Weak acetic acid partially, and the strong acetic acid completely dissolves the cell-wall, and brings into view the nucleus, which assumes the appearance of two or three, or even four or five granules close together, each with a central shadowed spot, and generally about 1-400th of a millimetre in diameter. Alkalies and ether completely dissolve the pus-corpuscle. Dr. BENNETT describes the production of the pus-cell as follows: — The exudation first forms a molecular and granular blastema, the individual granules of which unite together in twos and threes, and constitute a nucleus, from which a cell-wall arises. The early formation of pus may be observed in the matter squeezed out of unripe abscesses, and in the exudations from blisters and other inflamed surfaces. The cell-wall thus formed is about 1-50th of a millimetre in diameter, is highly elastic, and assumes shapes according to the degree and direction of the pressure to which it is subjected. Water and acetic acid dissolve the cell-wall, whilst the nucleus — which before the addition of these reagents, resembled an ordinary pus-corpuscle — exhibits the usual two or three granules, which may be considered as nucleoli. Dr. BENNETT thinks that the bodies, which have hitherto been considered as pus-cells, are only the nuclei of corpuscles, the delicate walls of which are dissolved very rapidly and at an early period; but whether this is invariably the case requires to be confirmed.

26. *Pus* varies in its characters with the surface on which it is formed, and the stage and course of its formation — with its age and circumstances affecting it. When formed on a *mucous membrane*, it is often mingled with epithelial cells in various stages of development. Some "*Histologists*" have talked of mucous corpuscles; but Dr. BENNETT very justly remarks that there are no bodies peculiar to mucus, what have been described as mucous corpuscles being either epithelium or pus-cells. When formed on a *serous surface*, pus-cells are associated with filaments, and with corpuscles which differ from them in structure. These corpuscles, from the frequency of their occurrence in plastic lymph, Dr. BENNETT has called *plastic corpuscles*. VALENTIN and others have termed them *exudation corpuscles;* and M. LEBERT and Dr. WALSHE *pyoid*, from their resemblance to those of pus. They are composed of a distinct cell-wall, inclosing from three to eight granules. They vary in size from the 1-100th to 1-75th of a millimetre in diameter. The addition of water and acetic acid causes no change in them, although the latter reagent sometimes contracts and thickens the cell-wall, and at others renders it more transparent. On some occasions, when the exudation is so abundant on a serous membrane as not to coagulate, and when the fibrinous and serous portions are not fully separated, the corpuscles assume the characters of those of pus, although some of the fibrous element, with plastic corpuscles adhering to them, may still be observed. Dr. BENNETT states that *pus-cells* are occasionally found in the fluid on the surface of cancerous ulcerations; but that he has never met with them in softened cancer of internal organs but in one case, when they were at once distinguished by the action of acetic acid. This reagent, by exhibiting the peculiar granular nucleus — or nucleoli — of the pus-cell, at once distinguishes this cell from young cancer-cells (§ 14.), from young epithelial-cells (§ 18.), and from fibro-plastic cells (§ 21.).

27. iv. FILAMENTS AND FIBRES. — Scirrho-cancer, cancroid, and various other morbid growths have generally for their basis a fibrous structure more or less firm, which presents all the characters as to early formation and development of fibrous tissues in healthy structures. Professor BENNETT * states, that sometimes the fibrous tissue consists of delicate filaments of 1-600th of a millimetre in

* The author has much pleasure in adopting the descriptions given by Dr. BENNETT of this and other tissues, because he has satisfied himself of their accuracy. Both in this country and in Germany, from 1816 until 1820, the author was much engaged in researches, chiefly anatomical, with the aid of the microscopes then in use; but he found his eyes so seriously affected, that he gave up the pursuit until recently, when the excellence of modern instruments induced him partially to resume it, as occasions offered. He has it in his power to state, that the observations he has made, which, however, have been comparatively few, have always proved the accuracy of British observers, more especially of BENNETT, WALSHE, BOWMAN, DALRYMPLE, JOHNSON, &c.

thickness; at other times of well-formed areolar tissue, the diameter of each filament varying from 1-500th to 1-400th of a millimetre in diameter. The addition of acetic acid often renders it more transparent, and presents visible permanent elongated nuclei. Such fibrous tissue is probably formed by the juxtaposition and ultimate development of the fusiform cells described above (§ 21.). Occasionally the fibrous structure resembles elastic tissue, the filaments varying from 1-300th to 1-250th of a millimetre in diameter, and presents the characteristic curled appearance. These different kinds of filaments are sometimes so closely placed together as scarcely to be separated by the needle, at other times they are loose, widely separated, and easily torn. "They may run together, side by side, in wavy bands; be mingled together in an inextricable meshwork; or arranged in the form of loops or circles, surrounding openings or loculi."

28. Fibrous tissue is said to be formed in three ways: — 1st. By the precipitation in a fluid blastema of fibrinous molecules, in the form of rows, which afterwards coalesce and become consolidated into filaments. This process has been shown in the buffy coat of the blood and in recent exudation from serous surfaces. — 2d. By the accumulation of granules, so as to form a spindle-shaped nucleus, which by its elongation splits up the coagulated exudation into laminæ and fibres, as is observed in many forms of fibrous tissue. — 3d. By the development of cells which become elongated at both ends so as to form a fusiform corpuscle, which ultimately splits up into filaments, as seen in chronic exudation on serous surfaces. All these modes of formation are seen in cancroid and other morbid growths.

29. v. CRYSTALS. — These are sometimes found in cancerous and other growths, especially if these growths have been kept any time, or are partly decomposed; or if they occur on mucous surfaces. "They then assume the prismatic and other shapes of the triple phosphate, and are the results of putrefaction. Irregularly formed crystalline masses are present in the structures, which undergo a calcerous degeneration. Crystals of cholesterine are occasionally found in the reticulum of cancer, and sometimes needle-shaped crystals of margarine." — (*Op. cit.* p. 160, 161.)

30. vi. BLOODVESSELS. — Dr. BENNETT states that he has never observed any thing peculiar about the *bloodvessels* in cancerous or cancroid growths, and that he believes them to present the same structure, and to be formed in the same manner, whatever that is, as in other tissues.

31. II. CHEMICAL COMPOSITION OF MORBID GROWTHS. — This subject has been considered by BENNETT and WALSHE, conformably with recent chemical doctrines; and for a full account of it the writings of these physicians, as well as those of LIEBIG, SIMON, DUMAS, DAY, and others, will be consulted with great advantage, although the chemical nature and relations of morbid growths are very imperfectly known. Dr. BENNETT indeed admits, that the present imperfect state of organic chemistry renders any investigation into the composition of morbid structures most unsatisfactory. All that can be determined is that morbid growths partake of the same constituent elements as other forms of exudation from the blood; and "that not only are there no means of separating chemically the different forms of scirrho-cancer and cancroid tumours from each other, but that it is also impossible to distinguish those from other morbid products, or even from healthy tissues. It is not by analysing large masses of morbid structure, including, as they do, granules, cells, filaments, and salts, mingled together, that any light will be thrown upon the chemistry of tumours; but rather by first separating, with the aid of the microscope, the minute structural elements entering into the composition of the growth, and then by endeavouring, by chemical manipulations under the same instrument, to ascertain the exact nature of each. Chemists have not turned their attention in this direction to any great extent; but histologists are enabled, by the use of very simple reagents, to separate the chemical principles of cancerous and cancroid growths into four groups, viz. 1st. Albuminous principles; 2d. Fatty principles; 3d. Mineral principles; and 4th. Pigmentary principles. Further than this they cannot go; but, fortunately, a knowledge of the relative amount of those is easily obtained, and yields very important information." — (*Op. cit.* p. 162.)

32. i. ALBUMINOUS PRINCIPLES. — Under this head Dr. BENNETT classes *albumen*, *fibrin*, and *caseine*, associating *gelatine* with these, although it materially differs from them. Albumen is the most abundant constituent of morbid structures. In this opinion—frequently stated in the course of this work — VOGEL, BRUCH, and BENNETT agree, whilst they also admit, that the more solid parts are fibrin, and that the fluid in which the corpuscles swim is albuminous, the one being necessary to form the filaments, the other the cells. Fibrin may thus be considered as being formed from albumen; for ZIMMERMANN has shown that fibrin results from a change in albumen, and has referred to the experiments of TIEDEMANN and GMELIN on the chyme, chyle, and blood of herbivorous animals, compared with those of carnivorous animals, which show that, notwithstanding the nature of their food, the chyme of the latter contains no fibrin, and their blood less fibrin, than the blood of the former; the fibrinous principle of the food of the carnivora being reduced to albumen during the primary digestion. The experiments of MAGENDIE, NASSE, and others, have shown that blood deprived of fibrin transfused into an animal, contained fibrin and became coagulable after having circulated for some time. From these facts it is manifest, that the fibrin of the blood is developed chiefly during circulation. On this subject Dr. BENNETT remarks, that "it seems extraordinary, if the muscular and fibrous tissues are formed from fibrin, that this principle should exist in normal blood only in the small proportion of from one to three parts in one thousand — a quantity wholly inadequate for the purpose."

33. But it should be recollected that the nutrition of muscular and fibrinous tissues is not merely an attraction of fully developed fibrin, but of the constituents or elements of fibrin, which are changed into, or incorporated with, fibrous structures by the influence of vitality; the fibrin existing in healthy blood being merely the residuum of the conversion of these elements. This view of the subject is supported by what is actually observed in diseases which impede the nutrition of fibrous structures, as in acute rheumatism, pneumonia, consumption, inflammatory fevers, &c. in

which the quantity of fibrin in the blood is excessive; for in these diseases the nutrition of these structures is either impeded or arrested, and hence the accumulation in the circulation of the elements forming them favours the development of fibrin in the blood, when vital power is not so far reduced as to prevent the attraction and cohesion of the constituents necessary to the production of fibrin. According to this view the increase of fibrin in the blood is a consequence of inflammatory diseases; the non-incorporation of the constituents of fibrin by fibrinous tissues — or the interrupted nutrition of these tissues — causing an excess of these constituents, and the attraction and cohesion of a certain proportion of them, according to the state of organic nervous energy, in the form of fibrin, during the process of coagulation, when the blood is removed from the system.

34. The existence of *casein* in scirrho-cancer, and in other morbid growths, is very doubtful, although its presence has been contended for by several chemical pathologists, in tuberculous and some other diseased structures. MÜLLER proved the presence of *gelatin* in enchondromatous and colloid formations. Dr. BENNETT states some preparations of colloid in his possession are still perfectly transparent after long immersion in alcohol; whilst others have been transformed into a white opaque matter, resembling boiled white of egg. Hence the chemical composition of this viscus fluid in cancer may be inferred to differ in different cases; but in what this difference consists, unless it be owing to the quantity of albumen it contains, has not been determined. The able investigator just mentioned remarks that, in a fluid state, the albuminous principles are, with the exception of caseine, not affected by the addition of acetic acid; but when once coagulated in the form of molecule, fibre, or membrane, they are again rendered more transparent by this agent. This property of acetic acid enables the histologist to render their sections and filaments of structures transparent, and to partly dissolve cell-walls. The filaments and cell-walls of scirrho-cancerous and cancroid growths are composed of albuminous principles, and the more filamentous and dense the structure is, the more does it abound in this chemical constituent.

35. ii. FATTY PRINCIPLES. — The modes in which fatty matters may be produced in the system, in health and in disease, have been much and differently discussed amongst chemists and chemical pathologists — a class or sect of pathologists which have again risen to celebrity, with LIEBIG at their head. Fatty matter exists in scirrho-cancer and other morbid growths in four states — as a nearly pure fat, in an almost saponified state, in a non-saponified state, and as a fatty acid. Dr. BENNETT states that it is never structurally free, for, being invariably associated with fluid albumen, no sooner is oil precipitated so as to assume form, than the minutest granule of it becomes enclosed in a thin coagulated film of albumen. Such granules may be recognised by the resistance they offer to the action of weak acetic acid, or by their disappearance on the addition of ether; and their number, in any given point of a structure, is a tolerable index of the amount of fatty matter present. Fat may also exist in the form of crystals of cholesterine, and of margaric acid. The French chemists insist that fat enters the body ready made in the food; whilst LIEBIG and his disciples maintain that it is formed in the system, 1st, by the *primary digestion*, and 2d, by the decomposition of the tissues or by *secondary digestion*. It is probable that, in morbid structures, its presence may also be sometimes imputed to a transformation of the albuminous constituents, or of a portion of them.

36. The existence of fat in healthy and in morbid structures may, therefore, be more correctly referred to the following different sources: — 1st. To the introduction of ready formed fat in the food; —2d. To the early processes of digestion; —3d. To the decomposition and absorption of the tissues; — and 4th. To the transformation of the albuminous principles. The *first* of these sources requires no remark. As regards the *second*, it cannot be doubted that animals which become very fat by feeding on grain, must have the power of converting the constituents of these into adipose tissue, as the very small proportion of oil which these contain could not be adequate to this result. The *third* source may be less readily admitted, although various considerations suggest its existence. As to the *fourth* source of fatty production, it certainly exists in morbid formations, and especially in albuminous exudations, more generally than is supposed. I have seen it repeatedly to a very great extent in the albuminous exudations formed between inflamed serous surfaces, more especially in the chronically inflamed cases; and when the albuminous exudations had passed to the state of organised, or partially organised, areolar tissue, this adventitious tissue appearing not only to contain oil-globules thickly disseminated throughout it, but, in some instances of long standing, gradually to pass into masses of fat, identical with other adipose parts. These changes in the adventitious membranes, adhesions, and parts connecting inflamed serous surfaces have been already noticed when treating of the alterations consequent upon inflammations of the *peritoneum* and *pleura*; but they have hitherto escaped the notice of pathologists. I have also observed this conversion of old exudations from, and adhesions between, serous surfaces into fat within the vertebral theca, in cases of prolonged paraplegia; and very probably this conversion is one of the modes of reparation, or of removing these consequences of inflammatory action, the albuminous principles passing into the fatty to facilitate their absorption through fine vessels or canals.

37. Connected with this subject, Dr. BENNETT remarks that it is probable, under favourable circumstances, that the albuminous principles may be converted into fat; for pathologists are acquainted with numerous facts, which prove that muscular, areolar, fibrous and other albuminous tissues may be so converted. The universal occurrence of compound granular corpuscles in old exudations is evidence of this, although it may be erroneous to suppose that the original transformation is connected with any influence possessed by cells. DONNÉ, after carefully removing all the globules from milk, and leaving no visible evidence of fat under highly magnifying powers, still succeeded in extracting it by means of ether. "Fat, then, is probably held in solution, and enters the cell-wall by endosmosis; where it is precipitated in the form of granules, which become enveloped

with a layer of albumen, and are prevented from passing out. In this manner fat, resulting from the disintegration of exudations, becomes accumulated in previously existing cells. Hence various kinds of these bodies act as mere storehouses for excessive formations of fat in morbid growths, as the adipose cells proper perform the same function in healthy tissues. In one, fat exists in the form of granules, in the other as a fluid oil, because pre-existing cells generally have for their contents albuminous matter in a state of solution, which is not the case with the adipose cells."—(*Op. cit.* p. 166.)

38. When the muscular system undergoes the fatty degeneration, it has been supposed that the deposition of fat by its excess causes atrophy, and subsequently destruction of the muscular fibres. But Dr. BENNETT states that, in watching carefully the progress of fatty transformation, he has convinced himself that it often commences in the very centre of the muscular fasciculus, apparently by the fibrillæ breaking up, losing their continuous and characteristic transverse markings, and assuming the form of minute fatty molecules, which afterwards become larger and larger, so as to constitute granules of various sizes. The same change is observed in muscles in the vicinity of diseased parts which for a long time have not been called into action. This observer adds, that "the whole fasciculus becomes thus affected, and at length large drops of oil accumulate in the interstices of the fasciculi, which gradually assume all the appearances of adipose cells, and, by their increase at the expense of the muscular fibre, communicate to it the yellow colour and other physical characters of fat. This conversion of the albuminous principle into the fatty, is brought about independently of the agency of cells or nuclei, and shows that, in the retrograde, as in the advancing process of nutrition, the molecular and granular element is the form of structure which is the basis of every other."

39. iii. MINERAL PRINCIPLES. — In scirrhous, cancerous, and various other morbid growths, as in every other exudation from the blood, more or less of mineral or saline matter is present, the amount however of which varies much in different cases. These form into crystals with the progress of decomposition, crystals of the ammoniaco-magnesian phosphate being not uncommon. More generally small collections of phosphate of lime are found either in granules or in masses, or in irregular fragments, which are soluble in the nitric and hydrochloric acids. Sometimes the mineral substance is so abundant as to impart to the dried growth an osseous appearance. This change may take place in cancerous as in tubercular formations, although not so frequently, converting portions of either into calcareous concretions. Dr. BENNETT states, that in some forms of cancroid growth, the mineral principle, like the fatty, seems to enter pre-existing cells in a state of solution, and to become afterwards precipitated, so as to assume somewhat of an organized appearance.

40. iv. PIGMENTARY PRINCIPLES. — The exudation of blood into the substance of scirrhous, cancroid, and other morbid structures, and the change in the exuded blood, as well as the alteration thereby occasioned in the tissues in which the blood exudes, are manifestly the causes of the different tints of colour which these structures present. The deeper hues are probably owing to some chemical change in the exuded blood and other fluids, and probably the colouring matter of bile may sometimes aid in modifying or deepening the tint. Dr. WALSHE considers the bright yellow matter, associated with fatty matter, sometimes forming a reticulum, or collected together in masses, to be analogous to the kirronosis of LOBSTEIN; but LEBERT views it as a peculiar kind of fat, which he calls xanthose. The black matter sometimes found in cancer, is owing either to the action of the morbid secretion of the diseased part upon the globules of the blood in the capillaries or exuded from them, or to the association of melanosis with cancer (see art. MELANOSIS, §§ 4. *et seq.*). That it originates in some change which the blood undergoes, is shown by the circumstance of this change having been traced in the same specimen through all the intermediate tints from blood-red and rusty brown to the deepest black. Dr. BENNETT has ascertained that the colour of the black matter, occasionally found in cancerous growths, is destroyed by nitric acid and chlorine, — a change which distinguishes it from the black matter which commonly accumulates in the bronchial glands and lungs of old people, and in the black phthisis of colliers. In the latter instance the black matter is undoubtedly carbon, in the former its nature is unknown.* — (See arts. LUNGS, § 185.; and MELANOSIS.)

41. III. GENERAL ANATOMY OF SCIRRHO-CANCEROUS AND OTHER GROWTHS. — i. OF SCIRRHO-CANCEROUS GROWTHS. — Continuing to adopt the description of Professor BENNETT, these growths are constituted of nucleated cells, presenting the characters attributed above to cancer-cells (§§ 13. *et seq.*), and infiltrated among the meshes of a fibrous stroma. Conjoined with the fibres and cells there is invariably present a viscous fluid, in which the cells swim, as seen under the microscope. The fibres, the cells, and the viscous fluid, are the three essential elements of these growths; and it is on the relative amount of each which determines the species of cancer. "If the fibrous element be in excess, it constitutes *scirrhus*, or hard cancer; if the cells be numerous, *encepha-*

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* According to SIMON and DAY, the following *proximate analysis* of scirrhus have been made by M. L'HERETIER: —

	Of Breast.	*Of Uterus.*	*Of Dorsal Region.*
Water	29·75	21·15	24·80
Albumen	28·10	29·85	21·70
Fibrin	18·80	15·20	27·15
Gelatin	7·60	-	8·17
Fat	2·00	-	8·05
Phosphorised fat	-	6·00	
Proxide of iron	1·15	1·25	traces
Yellow pigment	-	7·00	
Salts	12·60	9·55	10·13

A fatty growth analysed by NEES VON ESENBECK contained 23·0 of solid fat; 12·0 of extract of flesh; 11·0 of gum-like animal matter; 23·0 of albumen; 19·0 of phosphate of lime; and 1·5 of carbonate of magnesia. It is not stated whether this solid fat contained cholesterine; in all probability it did, as this substance is often found in fatty tumours. In a fatty tumour examined by MÖLLER, acicular crystals were found mixed with a grey substance which was deposited in vesicles and dissolved by boiling water, from which it was not precipitated by acids or the ordinary metallic salts. The crystals were insoluble in acids, water, or alcohol, but dissolved in ether; hence they probably consisted of cholesterine. Another fatty tumour contained some casein, precipitable from the aqueous solution by acetic acid.

loma or soft cancer; and if the fluid abound, or be collected into loculi or little cysts, it is *colloid* cancer. All these forms of cancer may frequently be observed in the same tumour—in one place hard or scirrhus; in another soft or encephaloid; and in a third jelly-like collections, or colloid. Yet, although they may pass into or succeed one another, they are not infrequently distinct from their origin to their termination."

42. *A. Scirrhus.*—Hard cancer has been fully described in the article CANCER; and I have therefore only to add at this place, that at all times a pulpy substance may be removed from a fresh-cut surface of it by scraping, which, on microscopic examination, is seen to contain numerous cancer-cells, mingled with molecules, granules, and fragments of fibrous tissue,—an appearance which distinguishes scirrhus from certain forms of fibrous tumour, which to the naked eye exactly resemble it. A thin section of the scirrhous growth is seen to be principally composed of filaments, of various sizes, running in different directions, sometimes forming waved bands, at others an inextricable plexus, among which the cells may be seen infiltrated, or forming loculi or cysts enclosing masses of these cells.

43. *B. Encephaloma.* — Soft, or brain-like cancer, has been considered in the article FUNGOID DISEASE. It consists of a soft pulpy growth, of a whitish, yellowish, or bluish tint, breaks down on moderate pressure, and yields a copious milky or creamy juice. It presents different degrees of vascularity; reddish parts or spots appearing, owing to extravasations of blood, or to degrees of vascularity. On examining a fresh-cut section, it presents a very loose fibrous texture; but in the denser parts it approaches the character of the soft portions of scirrhus. In the pulpy parts no trace of fibres is visible, or merely fragments of them. Yellowish parts, either reticulated or collected into masses, generally consist of fatty degeneration of the cancerous tissue, and form the cancer reticulare of MÜLLER. This yellow matter is often of cheese-like consistence, friable, and resembles tubercle, for which it has been mistaken. The blackish tinge is owing to black pigment (§ 40.) infiltrated in the cancerous elements, or existing within the cells, constituting the malignant melanosis, or melanic cancer of some authors. The cream-like fluid presents, under the microscope, a number of the cancer-cells already described (§§ 13. *et seq.*). Sometimes mingled with a large number of molecules, granules, compound granular cells, blood-corpuscles, and more or less of the fibrous element. (See art. FUNGOID DISEASE.)

44. *C. Colloid or Gum-Cancer.*—Glue-cancer, or collections of gelatinous matter resembling glue, calves' foot jelly, or semi-fluid gum, are found in masses varying from a minute point to the size of a large orange. In colour colloid is yellowish, greyish, brownish, or reddish; very rarely green or black. It may be transparent or amber-like, or semi-transparent or opaque, resembling honey. It may be disseminated in a fibrous texture, giving it a pearly aspect, or it may be collected in distinct cysts. "It is one of the most common constituents of compound encysted growths of the ovary, and it is not infrequently seen in cysts of the kidney, and follicular swellings of the skin."—(BENNETT.) On examination with the microscope, this substance is occasionally seen quite structureless, or exhibits only a fine molecular appearance, and it then has been called *colloid tissue*. At other times numerous nucleated cells, presenting all the characters of cancer-cells, in various stages of development, are found in it as a blastema; and it is then observed that the growth has a tendency to spread. This is *colloid cancer*.

45. "When colloid cancer is formed on a free surface, as on the peritoneum, it often presents small grains, of a grey colour, resembling coagulated gum-arabic. When collected in masses, these have an irregular nodulated aspect. A fresh section presents a surface with numerous loculi or cysts, which vary from the size of a pin's head to that of a walnut, filled with a clear glistening gelatinous matter, surrounded by fibrous substances or mesh-work." Cancer-cells originate in colloid matter, as in other kinds of blastema, by the formation of granules, nuclei and cells. The fibrous structure of colloid, according to Dr. BENNETT, never contains permanent nuclei, or affords any evidence of being developed from nuclei or cells; it seems rather to be formed by precipitation alone.

46. *D.* These *three forms* of true cancer are vascular, but in different degrees. Scirrhus is least so; colloid is more so then scirrhus; and encephaloma is most vascular — sometimes so much so as to bleed readily and profusely. These forms pass into each other, sometimes so imperceptibly as to render the arrangement of several specimens a difficult matter; more especially as respects scirrhus and encephaloma or fungoid cancer.

47. ii. OTHER MORBID GROWTHS.—Morbid structures, which, to the unaided sight, to the touch, and often in the progress of the case, so closely resembles cancer as to be frequently mistaken for it, and yet which presents on microscopic examination differences of a very marked character, have been termed cancroid by Dr. BENNETT. Hitherto, he remarks, this distinction has not been very accurately attended to; for, although practitioners have recognised the existence of fibrous, sarcomatous, warty, fatty, and other so-called non-malignant growths, experience every day proves that there are no symptoms which enable them to detect these with certainty.

48. *A. A fibro-nucleated cancroid growth* is described by this writer to consist of filaments infiltrated with oval nuclei. It can be distinguished from scirrhus and from encephaloma only by microscopic examination, as it sometimes closely resembles the one, and at other times the other. As to its minute structure this growth ought to be separated from true cancer on the one hand, and from fibrous tumours on the other. It is deficient in cancer-cells, which are essential to the first; and it possesses numerous naked nuclei in no way connected with cell-formation, which are not found in the second. This form of cancroid growth, however, evidently so closely resembles cancer, or possesses so much of what has been usually called the malignant character, in other respects, that a diagnosis is difficult. The most important distinction between it and true cancer is that, although it may return in the place originally affected, after excision, it does not appear ever to occur secondarily in the glands or other organs.

49. *B. Epithelial Cancroid Growths.* — Dr.

BENNETT considers that cancer of the lip, chimney-sweeper's cancer, noli me tangere, malignant ulcer of the face, cauliflower excrescence of the uterus, and other appellations are given to morbid growths, which have been considered cancerous or malignant, but which possess a very different structure, and are therefore only cancroid. Mr. PAGET pointed out the identity of several of these, considered them as warty in their nature, and ascribed them to hypertrophy of the papillæ of the skin. Dr. SIMPSON classed cauliform excrescence of the cervix uteri with soft warts and condylomata, and stated that it had often been confounded with carcinoma or medullary fungus. Examined by REID and GOODSIR it was shown to consist of groups of large nucleated cells. These and similar alterations of the epidermic and mucous surface Dr. BENNETT views as epithelial cancroid growths, and as essentially consisting of an hypertrophy of the mucous or epidermic layer, composed of numerous epithelial cells more or less impacted together (§ 18.). They may occur on large free surfaces, as the skin or digestive mucous membrane; or within mucous follicles, and the minute ramifications of secreting glands, as the mammæ, kidney, &c. In the former case, corns, callosities, condylomata, warts, and scaly eruptions of the skin, or polypi and fungous excrescences of the mucous membrane are occasioned. In the latter case, various kinds of encysted swellings, hairy and horny productions, and dilatation of the minute ducts in secreting glands by the desquamation and retention of their contained epithelial cells are produced. The forms of epithelial growth which more especially resemble cancer, and which are therefore cancroid, are — 1st. Certain warty and fungoid excrescences of the skin and mucous surfaces; — 2d. Some ulcerations of mucous membranes, especially those of the lip, tongue, and cervix uteri; — and 3d. The changes occurring in follicles and excretory ducts, the latter, when associated with hypertrophy of the surrounding fibrous tissue, constituting some forms of so-called sarcomatous tumours.

50. (*a.*) *Warty* and *fungous excrescences* are very common. The former are often observed on the fingers of young persons, more especially of those addicted to the vice of self-pollution; and they sometimes also appear about the face and neck. They consist of a congeries of elongated papillæ, sometimes flattened at the top, at other times presenting fissures and sulci leading to a common root. These tumours may vary from the size of a millet seed to that of a child's head. Dr. BENNETT describes them as having their surface sometimes smooth, at other times lobulated, composed of rounded groups of papillæ resembling a cauliflower. When small, they are almost wholly composed of epithelial scales, which assume a square or elongated form, their nuclei being usually very distinct. The larger growths internally consist of a fibrous structure, into which loops of vessels from the capillary network of the dermis is prolonged. They are covered by compressed epithelial scales. They often soften and ulcerate on their surface or at their base, some of the epithelial cells then enlarging from endosmoses and often resembling cancer-cells, whilst others are elongated and split into fibres. Mingled with the altered cells are numerous molecules and granules, and often pus-corpuscles, giving an ichorous character to the discharge from the sore or ulcerated surface. In this manner a cancroid ulceration may be produced, and proceed to a greater or less extent, the base of the ulcers being generally covered by papillated fungoid projections, the edge being elevated, indurated, and rugged.

51. The *polypi* which grow from the surface of mucous membranes are covered externally by thickened epithelial cells, are internally composed of fibrous tissue more or less dense, and are abundantly supplied with blood-vessels. They resemble in structure the excrescences just described, and like them may ulcerate, the ulceration, however, being much more frequently attended by hæmorrhage. These polypi are very common in the cervix and os uteri, and less so in other mucous surfaces.

52. (*b.*) Another form of *epithelial cancroid* is described microscopically by Dr. BENNETT as appearing first as an ulcer, sometimes as a slight induration of, or small wart on, the affected part. It is common on the under lip, on the tongue, and in the cervix uteri. In the lip, a furrow or groove is often observed early in the indurated spot. This slowly extends, in the form of ulceration, with indurated, thickened, and raised margins, is circular and cup-shaped, its surface being sometimes covered by a white-cheesy matter, at others by a thick crust; and proceeds until it involves a considerable portion of the structure, pouring out a foul ichorous discharge. In the tongue the base of the sore is fungoid and papillated, and dense, owing to the close impaction of laminæ of epithelium. On the cervix uteri, these ulcers have hard, irregular edges, yield a copious ichorous discharge, and cause more or less thickening of the adjoining textures. When examined microscopically, these cancroid ulcers present on their surfaces masses of epithelial cells, in all their stages. Some of these cells are spherical, nucleated, about 1-50th of a millimetre in diameter; others much larger. They often resemble cancer-cells when viewed alone, but are associated with flattened scales, varying in size and shape, sometimes in groups adhering at their edges, at others forming confused masses. Many of the cells and scales often reach an enormous size, and as they become old split into fibres. These elements are commonly associated with numerous molecules and granules, naked nuclei, fibro-plastic, fusiform and pus-cells. Immediately below the surface, the epithelial cells are more or less compressed and condensed; and, when the disease is very old, they present concentric laminæ, surrounding a hollow space.

53. (*c.*) *Cystic Growths*, consisting of epithelial cells and scales, often occur in minute follicles and crypts. They may also form within the excretory ducts of glands. They have been well-described by M. LEBERT and by Dr. BENNETT. The contents of these cystic growths are not merely epithelium-cells in all stages of development, but also fatty cells, granules, and crystals of cholesterine. These obstruct the duct, and then enlargement or tumour of a cystic kind is formed. These cysts vary from the size of a pea to that of a large orange; their appearance varying with the proportion of epithelium, or of fat, or of cholesterine they may contain. Quantities of epithelium are also thrown off from the lining of the

lateral ventricles in cases of cerebral meringitis, and in the ovaria during ovarium dropsy.

54. "In many fibrous, or so-called sarcomatous growths in glands, we frequently find the hypertrophied filamentous tissue forming loculi which vary in shape with the amount of lateral pressure they receive. This may occur in cancerous and cancroid growths, and the spaces so produced may be occupied by either cancer or epithelial cells. Hence, even on a microscopic examination, the latter may be readily mistaken by an experienced histologist for cancer. The fibrous tissue in both cases is the same, but the cells present the differences formerly pointed out between cancer and epithelial cells (§ 18.), the latter being frequently about the same size, and exhibiting a great disposition to run together in groups." The cystic formations in sarcoma are caused by the same circumstances as produce simple cysts in the liver, kidney, and other glandular organs: the minute excretory ducts are obstructed by granular exudations or exfoliations, and fluids accumulating behind them produce dilatations or cysts. Hence the frequency of encysted growths in structures furnished with follicles or ducts. Occasionally the epithelium is so closely impacted in the dilated ducts as to be turned out in the form of moulds of the tubes on making a section through them. "This form of epithelial accumulation in the ducts of glands, which are the seats of fibrous or sarcomatous growths, merits great attention, as to this circumstance must be attributed their great resemblance to cancer."—(p. 183.)

55. C. *Fibrous cancroid growths* consist wholly of fibrous or filamentous tissue, and so closely resemble scirrhus as to be continually mistaken for it. This fibrous tissue is formed as above described (§§ 27, 28.), and it may be thus produced in various tissues and organs. This tissue is the most universal both in healthy and diseased parts. It forms the stroma, or frame-work, of nearly all the tissues. "It exists in almost every kind of cancroid and cancerous growth: so that a fibrous tumour is one of these, minus the nuclei and cells, which give to each its peculiarities. Fibrous growths present themselves in numerous forms. One of the most common is that of *cicatrix;* another is that of a white glistening patch, so common on serous surfaces; a third is the chronic band or ligamentous tissue uniting serous membranes, the result of simple exudations of some standing; and a fourth is the peculiar induration of the skin, constituting sclerosis in children, and elephantiasis in adults."—(p. 184.) Cancroid fibrous growths assume two principal forms,—1st. Thickening or hypertrophy of the sub-areolar tissue of mucous membranes;—2d. Tumours of different varieties.

56. α. *Thickenings* and *indurations* of the submucous areolar tissue cause strictures of canals, as in the alimentary canal, urethra, &c. They may follow any protracted irritation causing exudation. Chronic irritation of the stomach, or gastritis, may induce a similar lesion, with hypertrophy of the muscular coats, so as closely to resemble scirrhus; and many cases of stricture of the intestines have a similar resemblance; and yet upon a close examination they contain nothing but the elements of fibrous tissue—are merely simply fibrous. This form of morbid growth consists almost entirely of dense bands of filaments of a glistening or dull white colour. Here and there, naked nuclei varying in size, or fibroplastic corpuscles, mingled with fusiform bodies, may often be detected between these fibres.

57. β. *Fibrous cancroid tumours* comprise, besides those which are strictly fibrous, those which have been usually called sarcomatous and neuromatous. Dr. BENNETT considers them all "to consist of a fibrous structure in different stages of development, the softer and more vascular forms being such, even when their elements have not yet completely passed into the perfect fibrous state. For this reason they have been made to constitute a distinct group by LEBERT, under the name of fibro-plastic tumours. Such growths may always be seen passing into true fibrous tissues. In some, whilst one part may be called sarcomatous or fleshy, another is truly fibrous. Other kinds of fibrous tumour resemble tough ligament and fibro-cartilage, presenting all kinds of intermediate degrees of conversion between the areolar and elastic tissues. Fibrous tumours may therefore be divided into—1st. Sarcomatous;—2d. Desmoid;—3d. Chondroid;—and 4th. Neuramatous fibrous tumours."—(p. 185.)

58. 1st. *Sarcomatous tumours* are either spherical or more or less lobulated. The first are of the consistence of muscular tissue or soft cartilage. Their surfaces, when divided, are smooth or finely granular, and their colour varies from a whitish yellow to pink or deep red, with the amount of vascularity. Sometimes on section, the surface is mottled from an intermixture of these tints, or ecchymosed. The vascularity of these tumours disposes them to ulceration and to the breaking down of their substance with the formation of a purulent fluid. They are generally encysted, originate in cellular tissue, and are found in fibrous and osseous structures. In the last-named situation they have been called osteo-sarcoma, a name which has been sometimes given to cancerous disease in this situation. LEBERT considers fungus of the dura mater to be sarcomatous. These tumours increase in size slowly, causing injury by their pressure on adjoining parts, not only impairing function but producing absorption and ulceration of the parts pressed upon. In a gentleman whom I attended for gradually increasing hemiplegia, passing slowly into general palsy and coma, one of these tumours existed in the upper jaw and another in the pericranium; and I stated that the palsy was most probably owing to a similar formation in the dura mater. On examination after death, this was found to be the case. A large tumour on one side having caused the hemiplegia, a small one being also present on the other side, and having produced the palsy of the other side also, shortly preceding dissolution. (See art. BRAIN and MEMBRANES, §§ 8, 9.).

59. Sometimes these tumours are more soft and lobulated, and are then readily mistaken for encephaloma. The lobules vary greatly in size, have externally a papillary or cauliflower appearance. They frequently resemble the pancreas, and were hence called pancreatic by ABERNETHY. The lobules are surrounded by a layer of more or less dense areolar tissue; and are of a greyish, yellowish, or rosy colour, according to their vascularity.

60. These tumours are found in many places.

below the skin copiously supplied with cellular and fibrous tissue. They are not infrequent in the mammæ; and in this situation they are distinguished from scirrhus with the greatest difficulty. M. LEBERT describes small mushroom-like growths on the conjunctiva which are sarcomatous, and which may destroy the eye by their size and pressure. Dr. BENNETT has found many granulations on the valves of the heart to consist of a sarcomatous and fibrous structure.

61. "The minute structure of these tumours is essentially fibrous, but many of the fibres are seen to be made up of congeries of fusiform cells closely applied together. These cells are of a spindle-shape, varying in length and breadth, and for the most part distinctly nucleated. Many of them may be seen branched at their extremities and passing into fibres, according to the mode of development of fibrous tissue described by SCHWANN. In some the nucleus will be found to have disappeared. Other of the cells will be found round or oval, or only slightly elongated; these are younger growths. In the same tumour all these different stages may be observed. In the softer parts, isolated cells and nuclei abound; whereas in the harder and denser parts, the development into fibrous tissue will be found more perfect."—(p. 187.) Some of the softer forms of sarcomatous growths contain cysts, and in these groups of transparent cells are observed, which present on the addition of acetic acid distinct round nuclei, about one-third the size of the cell. These cells closely resemble epithelial cells. The fibrous structure sometimes forms loculi, which may be crowded with these cells, so that in these cases fibrous and epithelial growths are conjoined.

62. 2d. *Desmoid fibrous tumours* are generally of a white or whitish yellow colour, tough and elastic, resembling the structure of the dermis. They are of a rounded or oval form, often imbedded in a cyst, consisting of the structures in which they lie. They vary in density from that of tendon to that of fibro-cartilage. On section they present numerous white glistening fibres intimately interwoven, or arranged in bundles, forming circles or loops interlacing with each other. They sometimes have a bony centre or nucleus. They are not very vascular. They vary in size from that of a pin's head to several feet in circumference. Dr. BENNETT possesses one four feet in circumference, and he refers to one still larger. They may occur in various tissues and organs—in the sub-cutaneous cellular tissue, in the sub-mucous tissue, and in the mammæ and uterus, where they are common. In the last situation, they often push the mucous membrane before them, and in this way grow outwards, forming one of the so-called polypi uteri. In other cases, they grow towards the serous or peritoneal cavity, pushing the membrane before them, and thereby forming a neck by which they are attached to the uterus, as if growing from it. The pedicle thus formed may break off, and the tumour thus become free in the peritoneal cavity. In the same way these tumours may become detached in the joints—loose fibro-cartilages; and even in the veins—when they have been named *phlebolites*. The minute structure of these tumours is chiefly filamentous, the fibriles varying from 1-700th to 1-800th of a millimetre in diameter. Their softer portions may be separated by a fine needle, but this is impossible in the denser parts. Sometimes the filaments are more or less waved; at others, they are curled and brittle, as in elastic tissue. Occasionally fusiform nucleated cells are found, indicating that these fibres are probably formed from cells. Sometimes isolated nuclei and corpuscles are also found, as in sarcomatous tumours, but the proportion of them is very small. The bony centres of these tumours are sometimes cartilaginous, at others composed of amorphous mineral matter, more rarely of true bone, two instances of which latter were seen by M. LEBERT.

63. 3d. *Chondroid fibrous tissues* were first accurately described by MÜLLER, and shown by him not only to resemble cartilage, but also to possess much gelatine in their composition. They vary in shape. When divided they present a smooth, milk-white, glistening surface, like fibro-cartilage. Their thin substance is very dense, separated with great difficulty by needles, but easily cut into thin layers. It crunches under the knife, and is very little vascular. Its intimate structure consists of fibrous tissue, resembling the fibro-cartilage of the ear, or the intervertebral substance.

64. The preceding kinds of fibrous structure may be associated in one tumour. Some are composed of several rounded or oval masses, varying in size, and surrounded, and separated from each other by a cyst, or layer of areolar tissue. The external surface, under such circumstances, is more or less nodulated. Some of these are occasionally soft and pulpy — semi-gelatinous, with a very sparing layer of fibrous tissue, whilst others are more or less tough, gradually passing into a fibro-cartilaginous density, and grating under the knife. Dr. BENNETT has observed, even of one nodule, parts soft and others hard, the former being cellular, the latter fibrous, every degree of variation existing between them.

65. 4th. *Neuromatous fibrous tumours* are formed in the nerves sometimes spontaneously, at others consecutively of injuries, especially of amputation. In the museum of the Richmond Hospital, Dublin, a series of these tumours are preserved, most of them taken from a person in whom almost every nerve presented knotty swellings, some of them varying from the size of a nut to that of a child's head. Dr. BENNETT examined them microscopically. Having been long kept in spirit, he could only determine the existence of fibrous bands running in various directions, mingled here and there with compound granular masses. In some fresh neuromatous tumours which he examined, it was demonstrated, "that in addition to bands of fibres running in waved lines, and sometimes forming loops, there were occasionally transparent cells, with a nucleus composed of two or more small granules, not affected by the addition of acetic acid."—(p. 190.)

66. *D. Cartilaginous cancroid growths* were first separated from cancerous and osteo-sarcomatous tumours by MÜLLER, who called them *enchondroma*. "When found in soft parts, or merely attached to bones, they are surrounded by an envelope of condensed areolar tissue, when in the bones by a bony capsule. In the first case they occur, although very rarely, in the glands, as in the parotid or mamma. In the second case, they are most common in the bones of the extremities. When formed in the substance of long bones, they

present rounded, smooth tumours; when in the periosteum or flat bones, their surface is rough and nodulated." The *structure* of enchondroma is the same as that of cartilage; it presents transparent nucleated cells, varying in size, isolated or in groups, situated in a hyaline substance. A network of filamentous tissue runs through the substance of the tumour, forming areolæ in which blood vessels ramify. The cartilaginous and areolar tissues vary in amount in different tumours. Sometimes the cartilage is in excess; and it then resembles that of young animals, the cells being unusually large. When the fibrous element abounds, then the whole mass is identical with fibro-cartilage, as in sarcomatous tumours (§§ 58—61.). Between these extremes there are infinite varieties, many of which may often be seen in one tumour. Occasionally a bony nucleus is found in a nodule of enchondroma, and sometimes these nodules present all the stages of transformation into bone.

67. Notwithstanding these peculiarities of structure, these tumours are often mistaken for osteo-sarcomatous or cancerous growths, chiefly owing to their occasional softening, and to their presenting, in such circumstances, the external characters of encephaloma. The softened portion, even under the microscope, may, without great care, lead to error, as the cartilage cells which float loose, mixed with granules and debris of the tumour, closely resemble those in cancerous growths.

68. *E. Fatty cancroid growths*, in the form of tumour, when mingled with fibres and other elements, may be mistaken at first sight for scirrhus. "Fatty tumours vary in size, but they may reach a growth weighing 30lbs. Sometimes their surface is smooth, at others lobulated. They are of a yellow colour, resembling adipose tissue; sometimes divided into bands by white fibrous tissue. The relative amount of these two elements varies greatly in different specimens; some being soft, oily, containing few fibres; others being harder, dense, the areolar tissue preponderating. For the most part they are very sparingly supplied with blood vessels, but these abound more in the fibrous varieties. In the latter case they are liable to ulcerate, and, under such circumstances, have frequently been mistaken for cancer. Some of these tumours, indeed, may be considered as fibrous or sarcomatous, combined with an unusual quantity of fat. Occasionally they are connected with the ordinary adipose tissue of the body. They are often surrounded by a delicate cyst or envelope; sometimes this is not perceptible. When the collection of fat resembles the ordinary adipose tissue, the tumour has received the name of *lipoma*. When it is more lardaceous, some have applied to it the term *steatoma*, in the same manner as when the substance is encysted."—(*Op. cit.* p. 193.)

69. The minute structure of these tumours varies with the amount of adipose or of fibrous tissue. The former is composed of vesicles of a round or oval form, altered more or less in shape by pressure. The vesicles vary from 1-20th to 1-50th of a millimetre in diameter. They are composed of a diaphanous cell-wall, frequently including a nucleus. The nucleus is round or oval, about the 1-100th or 1-200th of a millimetre in diameter. Occasionally it appears stellate, of a crystalline aspect, from the formation of crystals of margarine or margaric acid around it. On rupture of the cell-wall the oil may be made to flow out, and the cell-wall shrinks up. Collapsed cells may often be seen among the more perfect vesicles, mixed with globules of oil and fat granules. The fibrous element consists of filamentous tissue running between groups of adipose cells; but is denser, and occupies more space, according to the proportion in which it enters into the tumour. Steatomatous and melicerous fatty matter may sometimes consist chiefly of the cells or vesicles just described; or these may be mingled in various proportions with granular matter. In some melicerous encysted growths Dr. BENNETT found the whole to be composed of granules, among which faint traces of delicate cell-walls might be observed more or less compressed together. In all such productions the relative amount of the vesicular and granular element varies greatly.

70. Another form in which fat may occur is that of *atheroma*, consisting, for the most part, of numerous fatty granules, varying in size. Atheroma may constitute the contents of cysts, or the entire degeneration of certain glands, especially the mesenteric and lumbar. The fatty granules composing it vary from 1-600th to 1-400th of a millimetre in diameter. They almost entirely disappear in ether, leaving only a molecular albuminous matter. Similar fatty granules are also associated with most morbid formations, sometimes free, at others existing within cells. "This kind of atheroma is identical in structure and chemical composition with certain forms of the reticulum in cancer. The granular fatty matter is often combined with crystals of cholesterine, more or less numerous." Sometimes they accompany various kinds of chronic exudation, and formations of epithelium, as above noticed (§ 53.).

71. *F. Tubercular growths resembling cancer* are not uncommon. Dr. BENNETT remarks that a mass of enlarged tubercular lumbar glands in his collection presents all the external characters of cancerous growths; and that he has no doubt that many cases of so-called cancer of the brain and other structures in youth are only tubercular; for, however easily the tubercular structure may be distinguished in its miliary or infiltrated forms, it may closely resemble cancer when it exists only in one or two large rounded masses in an organ, and is more or less softened. In such cases it can be distinguished only by a microscopic examination. The characters of tubercle which readily distinguish it from cancer therefore require to be pointed out. A tubercular mass presents a yellowish or dirty white colour, and varies in consistence from that of tough cheese to that of thick cream. Sometimes it is soft in one place and indurated in another. On dividing the harder parts, the surface is smooth or waxy; the softer parts present a slightly granular surface. On pressure they are friable, and break down into a pulpy matter, but never yield a milky juice. "A small portion squeezed between glasses, and examined under the microscope, presents a number of irregular shaped bodies approaching a round, oval, or triangular form, varying in their longest diameters from the 1-120th to 1-75th of a millimetre. These bodies contain from one to seven granules, are unaffected by water, but rendered

very transparent by acetic acid. They are what have been called tubercle corpuscles. They are always mingled with a multitude of molecules and granules, which are numerous as the tubercle is more soft. Occasionally, when softened tubercle resembles pus, constituting scrofulous purulent matter, we find the corpuscles more rounded, and approaching the character of pus-cells. They do not, however, on the addition of acetic acid, exhibit the peculiar granular nuclei of these bodies." Tubercle corpuscles are very readily distinguished under the microscope from cancer-cells. Compound granular masses and cells, mineral matters, crystals of cholesterine, and the debris of the texture in which the morbid product is found, are also often detected in tubercular masses of some standing. These masses may also be sometimes transformed more or less into cretaceous and calcareous substances and either remain latent or be thrown off.

72. *G. A tumour*, which M. VELPEAU has called *fibrinous* is occasionally met with. It may, under certain circumstances, be mistaken for cancer. It is caused by an extravasation of blood, which coagulates, becomes paler, and ultimately yellow, like a clot of blood in the sac of an aneurism. These tumours vary in size, may occur in various situations, especially in the female breast, when they may be mistaken for cancerous tumours. Dr. BENNETT has also seen these tumours in different textures, especially in the placenta and in the spleen. The structure of one found in the spleen consisted of numerous molecules and granules, fusiform corpuscles, compound granular masses, and irregularly formed bodies, probably altered blood corpuscles, such as are commonly found in old extravasations. Instances in which these tumours in the breast were mistaken for cancer have been recorded by MM. LEBERT and BERARD.

73. *H.* A peculiar form of tumour, which HENLE has called *syphonoma*, is described by him and Dr. BENNETT. The specimen seen by the latter consisted of a large mass attached to the mesentery, that was in one place hard, fibrous, and nodulated, in another soft and cheesy, or even purulent, and in a third fibrous, but soft and of a dark red, resembling coagulated blood. Having been long steeped in spirits its minute structure could not be exactly ascertained. The part examined resembled a vascular plexus, anastomoses here and there having been distinctly seen.

74. *I.* The *enlarged glands* which accompany *typhoid ulcerations* in the intestines, and which are sometimes found especially in the mesentery, will rarely be mistaken for cancer. They vary in size from that of a hazel-nut to that of a hen's egg. They are vascular externally, of a bright red or purple colour, are soft and pulpy to the touch, and on section present a slightly granular surface, of greyish or fawn yellow colour, frequently exhibiting the commencement of softening. They are friable, and yield a greyish, or dirty purulent-looking fluid on pressure. The matter infiltrated into the texture of the gland is the typhous deposit of ROKITANSKI, ENGEL, and other German pathologists. The fluid squeezed from these glands was found by Dr. BENNETT crowded with cells, naked nucleoli, blood corpuscles, granules and molecules. The cells are generally spherical, varying in diameter from the 1-50th to the 1-35th of a millimetre. The nucleus occupies about three-fourths of the cell, and is composed of an aggregation of numerous nucleoli, of about the 1-200th of a millimetre in diameter. "Sometimes from one to four of these nucleoli are seen scattered within the cell, either with or without a round or oval transparent nucleolated nucleus. On the addition of acetic acid the cell-wall is rendered very transparent, whilst the nucleoli are unaffected. Many of them are free, and looked at first like altered blood globules, from which they are at once separated by the action of acetic acid. I have called these bodies nucleoli, from their holding that relation to the nucleus in well-developed cells, although at other times they may be considered as nuclei, no other bodies being present within the cells."—(BENNETT, *Op. cit.* p. 200.)

75. IV. PATHOLOGICAL RELATIONS OF SCIRRHOUS AND OTHER TUMOURS. i. OF SCIRRHOUS GROWTHS.—*A.* The *origin* of these growths has been the subject of much discussion. In the article CANCER certain views of this matter have been noticed, but others have been recently published. It was supposed by VELPEAU (*Revue Médicale*, t. i. 825, p. 357.), from two cases in which encephaloid-looking matter was found in venous coagula, without disease of the veins, that cancer may form primarily in the blood. But there is no evidence that the matter was really cancerous in these cases. VIRCHOW, however, states that he has seen cancer in the large venous trunks in six cases, and that he is convinced that they may thus arise locally in coagula of blood. GLUGE and NONAT discovered cancer-cells in a clot in the right iliac vein, the walls of the vein being smooth and not red; but in these, as in several others which have been recorded, cancerous disease existed in the viscera, and the cancerous matter in the blood may have arisen from venous imbibition. In the present state of our knowledge there is no proof that cancer may exist in the blood primarily, or independently of similar growths in other parts of the body. It is possible, however, that the liquor sanguinis may, in peculiar circumstances, act as the blastema of cancer within the vessels as well as when exuded; such an occurrence however must be rare. Dr. BENNETT, whose researches have been so able, infers that the filaments, cells and fluid, which together compose scirrho-cancerous structures, originate in a coagulated exudation, which is poured out in the same manner as other forms of exudation—namely, by enlargement of the capillaries, their repletion with blood, and the transudation through their coats of the transparent liquor sanguinis, which, coagulating outside the vessel, forms an exudation more or less solid. The exudation when first perceptible consists of a finely molecular and granular matter, in which the cancer-cell arises as in a blastema, in the manner already described (§ 14.). This view accords with that which I have stated in the article CANCER (§ 26.); and shows that the change in the blastema, or exuded fluid, depends upon the state of constitutional and local vital endowment.

76. The exudation constituting the blastema of cancer is generally infiltrated between the filaments of areolar tissue. The nature of the tissue influences the formation of adventitious growths;

and the areolar tissue, probably from its lower vital endowment, seems to favour the production of scirrho-cancer. While part of the exudation in this tissue passes into cells, another portion becomes fibrous, as observed to occur in a simple exudation during the healing of an ulcer or wound. All that is known of this stage of the production is, that filaments and fibres are formed, which are interlaced among the granules and cells of the blastema, to constitute the stroma of the growth, the form and density of which is dependent upon its arrangement and amount. "At first the cancerous exudation is fluid; and some of the albuminous principle held in solution, by coagulating, allows a certain quantity of serum to be set at liberty. In most instances this is in a great measure absorbed; but in a few, owing perhaps to some peculiarity in its formation or amount, it is retained in the meshes of either the pre-existing or new areolar tissue." Such Dr. BENNETT considers to be the origin of colloid cancer. The colloid matter so collected becomes in turn a blastema for the formation of cancer-cells, as above described (§ 14.).

77. It is obvious that the exudation productive of scirrho-cancer must differ, either primarily or consecutively, or both, from the exudation of inflammation, or of scrofulous or tubercular cachexy. In what the difference consists we are ignorant. In this the histologists have not enlightened us. Most probably the cancerous exudation is primarily different from these, owing to the state of vital endowment of the tissue affected, and that the difference increases with the retention of the exudation in the tissue which it infiltrates. The characters imputed to the blood by ROKITANSKI, ENGEL, HELLER, and others, assigning a specific dyscrasia of the blood, or an excess of albumen or of fibrin in the blood, are vague, uncertain, and unsatisfactory. Dr. BENNETT believes that the cancerous peculiarity depends not upon the vascular system, which is the mere apparatus for the production of the exudation; not upon the nervous system; and not upon the texture, which is merely the seat of the exudation, as that varies: but in the inherent composition or constitution of the exudation itself. But, in this belief, this pathologist is not sufficiently precise; for if he means by the nervous system the spinal nerves, then it may be admitted that these can have little or no influence in determining the nature of the adventitious growth produced from a fluid blastema. It is, however, by no means so certain that the soft or ganglial nerves, which supply the vascular system, and which preside over nutrition and secretion, are so unconcerned in determining the nature and growth of the morbid formation as here stated. We know that all the forms of scirrho-cancer appear in circumstances and from causes which depress organic nervous energy, and impair the activity of the excreting or depurating functions; and which, moreover, diminish vital resistance, and favour the development of adventitious cell-formations and of parasitic productions. As these cell-formations become more perfect, and acquire the power of self-development, so as to spread and invade adjoining tissues, they soon burst forth, ulcerate, contaminate the circulation, and form exuberant fungoid excrescences, filling up or even extending beyond the textures which they destroy; and they thus impoverish and infect the fluids, and exhaust organic nervous or vital power. (See arts. CANCER, §§ 11. *et seq.*, and DISEASE, §§ 151. *et seq.*)

78. *B.* The *growth* of scirrho-cancer is merely the extension of the fibrous tissue, cancer-cells, and nuclei above described (§§ 41. *et seq.*). The old cell-walls dissolve or break down, and the included new cells and nuclei are liberated, and give rise to others in turn. For this purpose, however, a certain amount of blastema is requisite. "This is obtained at first from the original exudation poured out; but, after a time, as the fibrous tissue increases, new vessels are formed in it, which continue to furnish materials for the new growth, in the same manner as the old vessels furnish materials of growth to the old tissues." A pre-existing tissue exerts much power over new formations in its substance or immediate vicinity; and hence, when a bone is fractured, the matter exuded is transformed into bone; and other tissues are restored when divided by a texture analogous to the one injured. "Very compound tissues, as the skin, lungs, muscle, &c., are never completely restored, but a cicatrix is formed, composed of fibrous tissue. On the other hand, epithelial and epidermic structures are easily restored and reformed, and so are all textures which wholly consist of cells. Hence the more a cancerous growth abounds in cells, the more rapidly it grows, and the greater is its power of re-development." Some pathologists suppose that this power depends upon pre-existing and permanent nuclei, or germinal centres. But as to the truth of this, Dr. BENNETT does not inquire, considering it sufficient to know — what, however, was sufficiently known before histology came into vogue — "that a tissue once formed and furnished with blood-vessels possesses the property of growth; that is, of exerting a species of selective vital attraction on the blood, whereby such matters are transuded through the capillaries as are readily transformed into a substance like itself." But this act of growth, which I believe to be correctly attributed to vitality, the sect of chemical pathologists would consider as altogether chemical; whilst another sect would consider it as simply one of endosmosis. Of the more prominent features of the growth of cancer, and of the extension of the malady and contamination of the circulation, I have nothing to add to what has already been stated in the articles CANCER and FUNGOID DISEASE.

79. *C. Is cancer contagious?* This question has been answered in the negative by some, and in the affirmative by others. Inoculation has even been resorted to in order to test the fact.—(*a.*) The *negative* evidence is chiefly the following. Dr. WALSHE says that he has known women afflicted with advanced cancer of the uterus take refuge in hospitals from the importunities of their husbands, and that these men were perfectly free, according to the assurance of their wives, from ulceration of any kind. Dr. BENNETT states that his hands, more than once, have been immersed in the creamy fluid of encephaloma, whilst recent scratches have been upon them, without the slightest irritation having resulted. VOGEL states that he injected fresh cancer-cells from a tumour into the blood-vessels of a dog, without any morbid change being manifest eight months after-

wards. GLUGE has also been unsuccessful in his attempts to inoculate the disease.

80. (*b.*) The *affirmative* evidence is chiefly the following. LANGENBECH injected the fluid from a cancerous tumour, while still warm, into the blood-vessels of a dog, with the effect of inducing secondary cancerous formations in the lungs of the animal. Dr. WATSON states that he has known two cases of cancer of the penis in men, whose wives were afflicted with cancer of the uterus. Some years ago, a patient was attended by Mr. MAYO and myself who was the subject of carcinoma of the penis and inguinal glands, and who soon afterwards died of the disease. The malady had commenced in the glans penis, and he had infected his wife, who was found on examination with open cancer of the os uteri; and she died of the disease a considerable time after her husband. In this case there was no doubt of the husband having infected the wife, owing to the morbid matter from the ulcerated glans penis having been left in undisturbed contact with the os uteri. Mr. MAYO informed me that he had met with another case altogether similar to this. Dr. BENNETT asks if the cases, to which Dr. WATSON has alluded, were proved to have been cancer by a microscopic examination? But he has already shown that such examination adds but little to the diagnosis of cancer; and it is well known that the majority of cases of open cancer, as these were, are so obvious, as not to be mistaken even by the most inexperienced. Dr. BENNETT concludes, that it is certainly opposed to experience that cancer can be communicated by contact or inoculation. I believe, however, that it can be so communicated, if circumstances favour the communication, more especially if the recent discharge from a cancerous ulcer is brought into, and remains for some time in undisturbed contact with a mucous surface, or part denuded of its cuticle.

81. *D. Degeneration of cancerous and cancroid growths.*—Dr. BENNETT remarks, that it is with the life of a cell as with that of the most highly organised individual: "it has its origin and birth, it gradually increases until it reaches maturity, then declines or degenerates until it has ceased to exist. The individual elements of a cancerous growth, like those of the healthy tissues of the body, are continually undergoing this process; like them, it leaves germs which continue to regulate its growth so long as they receive nourishment, and thus the structure, as a whole, is perpetuated. Sometimes this process receives a check from the cells, which are the entire agents of growth, being rendered abortive, and the result may be—1st. A fibrous cicatrix;—2d. A fatty mass;—or 3d. A calcareous concretion."—(*Op. cit.* p. 210.)

82. (*a.*) It has been stated above (§ 78.) that the cell-wall of the cancer-cell dissolves and breaks down, and thus liberates the young cells. This is the natural completion of individual cell-life. It has been shown that the increase of cells is dependent upon a due supply of blastema, in order to supply the materials of assimilation. Several cases are known, and one has come under my own especial and prolonged observation, when a cancerous ulcer has undergone the same changes as a simple ulcer; the cancer-cells in the one, and the pus-cells in the other, becoming gradually less in number, whilst the *fibrous element* has increased and terminated in the formation of a cicatrix. Dr. WALSHE has adduced several instances of this transformation; and Dr. BENNETT thinks that this is a more frequent occurrence than is generally supposed. The only question is whether the pre-existing morbid growth was actually cancerous or not; but the local appearances and sensations, and the constitutional symptoms, have certainly been such, in rare cases, as warranted the inference that the growth was actually malignant. This writer states, that Dr. BOCHDALEK of Prague has met with instances of cancer of the liver, in which the diseased structure broke down into a cream-like matter, the fluid parts being absorbed, and the whole shrinking together, forming a puckering on the surface often corresponding to a fibrous mass, or a fatty material, in which collapsed cancer-cells may be detected.

83. (*b.*) It has been stated above (§ 14.) that the cancer-cell may be rendered abortive by the deposition of fat-granules between the nucleus and cell-wall, and by their pressure upon the former, and the ultimate disintegration of the whole body into numerous fatty molecules and granules. "This is a very common termination of the life of individual cancer-cells; and, when the process is carried on to any great extent, the fat granules often collect in masses, and mingle with old cells, which exhibit various stages of their retrograde progress, and old nuclei, which have more or less resisted disintegration, are at length observable to the naked eye. In this manner the yellow masses, and yellow reticulated appearance in certain cancerous growths of some standing are produced—an occurrence so common that MÜLLER described it as a particular form of the disease, under the name of *cancer reticulare.*"—(p. 212.)

84. Professor BENNETT, H. MECKEL, and VIRCHOW, agree in describing the reticulum of MÜLLER as disintegrated cancer; or as composed of broken-down cancer-cells, the nuclei of which sometimes remain; at other times the whole has undergone the fatty transformation, and been converted into compound granular cells; and not infrequently, in the last stage of the process, nothing but molecules and granules can be discovered. Dr. BENNETT considers that this change is not a proof of so-called secondary inflammation of the growth, as is supposed by WALSHE, ROKITANSKI, and LEBERT; but that it is the same transformation that occurs in all old exudations, and in various organs where pre-existing cells undergo the fatty transformation, as in the liver, to constitute fatty liver, the kidney to form BRIGHT's disease, &c. The matter forming the reticulum occurs in *two forms.* In one, it is seen in the fresh-cut surface, scattered throughout the growth, in the form of a net-work, more thick, however, and abundant in some places than in others. In the second form it forms masses, of a bright yellow or orange colour, occasionally resembling tubercle, more or less friable, and of cheesy consistence. In the former compound granular corpuscles are most common; in the latter, irregular bodies, resembling tubercle-corpuscles, resulting from alteration in the form of the nucleus, after the cell-wall has been broken down. These are called bodies of the reticulum

by BRUCH. Compound granular cells are very common in cancer, and are to be considered as evidences of degeneration of the cancer-cell. The greater their number and agglomeration, the greater the degeneration. The fatty degeneration is rarely uniform throughout a cancerous growth; commonly, whilst one part is converted into a fatty network, another is only partially so changed. This accounts for cancer having such a tendency to spread to other tissues, and for the destruction of one part being rarely attended by the reduction of the whole mass. Sometimes, however, the fatty degeneration is associated with the fibrous degeneration (§ 82.), and extends to the whole morbid structure; and it may then be further associated with an early stage of the calcareous transformation next to be mentioned. (BENNETT.)

85. (*c.*) A cancerous growth may degenerate into an accumulation of the *earthy matters* originally contained in the exuded matter. This form of cancerous degeneration is analogous to that sometimes observed in tuberculous formations. The cells break down, the more fluid and soft parts are absorbed, and the mineral parts are left concreted in the form of a calcareous mass or masses, of various sizes and shapes. This degeneration of cancer is very rare. Dr. WALSHE appears not to have met with it; although he mentions the bony lamellæ, which are continuous with part of the skeleton, and which characterise certain cancers connected with the osseous structure. Dr. BENNETT has however observed it in two instances. In one he observed mineral masses mingled with broken down cancer-cells in the mesenteric and epigastric glands, "some of which felt hard from calcareous depositions, others were infiltrated with a putty-like substance, and a few were composed of an external shell of hard calcareous matter; whilst their interior consisted of a semifluid, gritty, diffluent material, which flowed out on breaking them."

86. (*d.*) The *three kinds* of degeneration of cancerous growths may be variously associated in retrograde cancer; these may be the fibro-fatty degeneration, with either element in excess, or one or both these conjoined with the accumulation of mineral matters in smaller or greater masses. In these cases there is generally a loss of substance, occasioning a sinking inwards, with puckerings of the adjoining surface. These changes occur only in cancerous growths of considerable duration, without ulceration or the formation of a cicatrix, as observed in the mamma when the nipple is retracted, and in the surface of some cancerous tumours. VIRCHOW ascribes the central depression in the white encephaloid masses of the liver to this cause. Dr. BENNETT views the stellate puckerings on the surface of cancerous growths as far from uncommon; and certainly when this appearance exists there must necessarily be loss of substance and contraction of surrounding tissues; and these changes can only result from a partial degeneration of the morbid structure, more especially of the older parts of it, although an extension of it to adjoining parts may actually be proceeding. I may therefore conclude, with the writer just mentioned, that cancer may undergo transformations, tending in very rare cases to a spontaneous cure; and that these transformations are into a fatty or a calcareous matter,—that the morbid growth is checked, and that it consequently shrivels up, some of the softer parts being absorbed, the rest remaining inert. The contraction of the surrounding parts in these cases, and the fibrous stroma of the cancer, constitute the puckerings and cicatrices observed as evidences of a cure. Dr. BENNETT considers that the facts which he has adduced are unequivocal proofs that a cancerous growth may undergo spontaneous cure. In the case of a lady nearly related to, and almost constantly under the observation of the author, a cure certainly took place without any local treatment, the constitutional means about to be mentioned (§§ 122, 123.) having been assiduously employed.

87. ii. THE PATHOLOGICAL RELATIONS OF OTHER GROWTHS.—This subject has been noticed, as to most of what is known respecting it, when describing the anatomy of non-cancerous tumours, and in the article DISEASE (§ 110.). Fibrous, epithelial, cartilaginous, and fatty growths, or those formations which are not adventitious as respects the œconomy (see DISEASE, § 111. *et seq.*) may be ascribed to an error in nutrition, or to a hypertrophy or excessive deposition or nutrition of these several structures in the parts in which they occur. The cause of their origin and development is not known, although certain circumstances connected with their formation have been noticed. But, why either of these formations should occur in preference to the others we are ignorant. Certain of them may be caused by an injury of, followed by increased exudation into a part, the exuded fluid undergoing changes favouring some form of nutrition in preference to others; but the same kind of tumour may occur without any such or any manifest cause. Tumours may form in the ovaria, or even in the substance of the uterus, or rather within the ducts and uterus, owing to an imperfectly developed or an unimpregnated ovum, detached partially or altogether, and arrested in either of these situations, sexual excitement having been imperfectly gratified or insufficiently developed. Other morbid growths are to be ascribed to an original constitutional vice, as the scrofulous and tubercular; and some are more or less dependent upon a constitutional predisposition acquired at an antecedent period, as the sarcomatous, fatty, and some others described above.

88. *A. May morbid growths, not originally scirrhous or cancerous, be transformed into either of the forms of cancer?*—This question has been differently answered. As respects certain tumours or growths, as the tubercular and enchondromatous, no such transformations take place; but as regards some others the change is possible, although not demonstrated. Dr. BENNETT remarks that growths furnished with blood-vessels, such as the fibronuclear, epithelial, and fatty, may possibly be so changed, although it would be difficult to establish the change. But with respect to fibrous growths, the result of a simple exudation, or hypertrophy, at first of purely local origin, its occurrence seems to him to be absolutely proved. "According to LEBERT, inflammation (simple exudation), tubercle, and cancer, are separated by distinct characters, originate from separate blastemata from the first, and never pass into each other. In this opinion I think he proceeds too far; for why may not a cancerous exudation be formed into the filaments of a vascular, fibrous, or fatty tumour,

as well as among the filaments of the normal areolar tissue of the body? We are continually meeting with cases where a blow or injury on a part producing a swelling with the ordinary symptoms of inflammation is, after a time, followed by cancer. An indolent tumour may exist for years, and then suddenly assume the characters of cancer. Are we to suppose that such a tumour was composed of fibres and cancer-cells from the first, and that the growth of the latter had remained stationary all that time; or that nothing but a fibrous tumour existed at first, in which cancer-cells were afterwards formed? The latter appears the most reasonable proposition."* (p. 217.)

89. *B. The enlargement of growths* takes place from blood-vessels, which either permeate the mass, or supply only portions of it, or reach to a greater or less extent of its surface. "In the first the growth is said to enlarge by intussusception; in the third by pure imbibition; in the second by both means. These distinctions are less important than they on first view seem; the perfect nutrition of the extra-vascular natural tissues proves, as a general fact, the vigour and efficacy of the imbibition process; and, in truth, imbibition is at play in all nutritions; for the nutrient elements of vascular tissues must be imbibed through the coats of their vessels, and it may be in addition through a stratum of cells. Enlargement by intussusception differs therefore from that by imbibition, in degree rather than in kind. In whichever way conveyed to the seat of growth-formation, the nutrient material, at first fluid, is *evolved* and *appropriated* by continuous cell-generation. Now this cell-generation may be affected on an *endogenous* or an *exogenous* plan. When the plan is endogenous, the germs of young cells are evolved and contained within older ones; those secondary cells are endowed with a similar procreative faculty; the tertiary series are in like manner fecund, and so on. Here a single cell may be regarded as the *potential embryo of an entire growth.* When, on the other hand, the plan is exogenous, the germs of new cells are not found within, but lie, and are evolved outside old ones."

90. "Where endogenous evolution prevails, and a cell is, potentially considered, a tumour in futuro, the perpetual production of similar cells is easily intelligible; the offspring that follows is as the parent that went before. But, in exogenous growths the continuous germination of infinite series of like cells is not readily conceived. It may be surmised that, when a series of cells has sprung into being, this series acts on the evolution of succeeding ones, as a natural vascularized is known to do on the generation of epithelium cells; the formed series so influences newly-exuded blastema (of which it constantly excites the accession), that this shall produce a new series of cells similar to itself. But, however the perpetuation of like cells be understood, be it remembered that the thing itself has its limits; for deposits may appear in growths, pseudo-tissues are among their frequent constituents, and a growth of one kind may establish itself a nidus within the area of another generically dissimilar. Elder cells thus seem (within certain limits) to cause the increase, and regulate the qualities of younger ones. Younger cells are, on the other hand, more or less active agents in effecting the destruction of the older ones; less so in endogenous growths, where the elder may increase materially in size (as their contained brood multiplies), and acquire thickened walls; more so in exogenous growths, where such enlargement of cells is not witnessed, and where the production of young is coeval with the disintegration of old ones."—(Dr. WALSHE, art. PRODUCTS, ADVENTITIOUS, *in Cyclop. of Anat. and Physiol.*, vol. iv. p. 120.)

91. *C. The reproduction of growths or tumours* is of importance as regards the diagnosis as well as the treatment. Dr. WALSHE, in his very able article just quoted, observes that "growths of all descriptions are liable, when removed spontaneously or by art, to be *reproduced* in the spot they previously occupied, if the removal have not been absolutely complete. The particles left behind act as attractive forces for new blastema convertible into cells, similar to those of which themselves are composed. This mode of reproduction (as it is erroneously called, for it is nothing more than enlargement, facilitated by removal of pressure of pre-existing substance) occurs with growths of all kinds, cancerous, sarcomatous, fibrous, fatty, enchondromatous, erectile, &c. But it would appear that in some cases of surgical removal, when the whole mass has, as is presumed, been extirpated, a new growth vegetates in its place. The difference of the cases is often rather apparent than real; we have distinctly found the germina of cancer in tissue, reputed healthy, surrounding a cancerous mass; and it is manifest that such germina, though invisible to the naked eye, may, quite as readily as a fragment of diseased tissue of even considerable size, act as the efficient agents of new development. When, independently of this mode of generation, the disease returns in the seat of its former growth, the occurrence must depend upon the continuance of that depraved state of the blood which is fitted to supply the necessary blastema, and likewise, possibly, upon some peculiar state of vessels of the part favouring its exudation here rather than elsewhere." (p. 121.) That the blood and blood-vessels are thus more or less concerned in the re-development of morbid growths may be admitted; but something, if not more, should be imputed to the depraved influence of the organic nerves supplying these vessels and the part affected. (See art. CANCER, § 26.)

92. In cases where the growth appears in one or more places remote from its primary seat, Dr. WALSHE remarks that the occurrence, which is termed the "distant reproduction" of the growth, is explicable in two ways. "The newly discovered growth may have existed previously to the extirpation of the old one, and having simply acquired additional activity, so become obvious, after that extirpation; or the new growth may have really first appeared subsequently to the removal of the old one." The latter alternative Dr. WALSHE believes to be rare. There is, however, reason to consider it to be more frequent than he admits; and to be produced not merely in

* I have, in the foregoing pages, been much indebted to the work of Professor BENNETT on "*Cancerous and Cancroid Growths;*" but I have been unable to adduce more than a part only of his researches. His numerous and interesting cases, his careful microscopic examinations, and his graphic illustrations, should not merely be perused, but carefully studied, by every physician and surgeon, in connection with his lucid descriptions of each kind of morbid growths, as exhibited in the pages of his very original and able work.

the way which he states, although that way certainly exists to a certain extent. Of this consecutive production of the morbid structure in distant parts, he considers the simple explanation to be that the vitiated state of the blood, proper for the supply of the necessary blastema, continues; and that this blastema is poured out in some other part of the frame, the original tumour no longer existing to attract its deposition within or around itself. That this explanation may hold good, either altogether or in part, I shall not here dispute; but the organic nervous influence, controlling, as it does, the functions of assimilation, nutrition, depuration, and excretion, certainly has a primary, and by no means a small, share throughout, in the distant reproduction and extension of cancerous and other tumours.

93. *D. The changes produced in tumours* during their evolution may be viewed as departures from the regular processes of their formation. The most important of these changes are their degeneration, which has been considered as regards cancer, and the removal or conversion of some of the non-cancroid, spontaneously, or by the aid of internal means. These, however, are only rare occurrences. Much more frequently morbid growths experience the principal diseased actions to which the natural or healthy structures are liable, as congestion, infiltrations of serum or of blood, hæmorrhage, inflammation, gangrene, depositions of matters foreign to their nature; and, as consequences of these, various discolorations and changes in consistence.

94. *E. The effects produced by tumours* and other morbid productions upon surrounding structures are most important, the injuries produced by them, in many instances, being chiefly of this kind. These effects are *mechanical* and *vital*. (WALSHE).—(*a.*) The *mechanical effects* are principally pressure, displacements, detrusion or extrusion, condensation, discoloration, infiltrations, interrupted circulation, occlusion of natural cavities or canals. When tumours form between muscular or moveable parts and the membrane covering these parts, they generally are detruded from the original seats of formation, and, as they increase, they present stalks or peduncles by which they are attached to these seats, as most commonly shown by tumours in the uterus, which, assuming this shape from detrusion, and often subsequently from extrusion beyond the cavity of the organ, have been improperly called polypus.

95. (*b.*) The *vital effects* of tumours on the surrounding tissues are softening or rarefaction, atrophy, hypertrophy, inflammation and its usual results, as adhesion, induration, ulceration, mortification, perforation; changes in the blood-vessels; hæmorrhages; alterations of the sensibility, from numbness to the most intense pain; and infiltration of the surrounding textures with matter similar to that composing the morbid growth — an effect observed chiefly in respect of cancerous tumours. Dr. WALSHE considers this last effect to occur in connection with no other growth except cancer, and to constitute one of the most evident distinctions between cancerous and other allied formations.

96. iii. THE SEATS OR LOCALIZATIONS OF TUMOURS AND MORBID FORMATIONS.—*A.* Certain tissues and organs are much more liable to be the seats of growths than others, more especially the cellular tissue, and the female sexual organs. Dr. WALSHE observes that, while cellular tissue is the favourite site of growths, fibrous textures but rarely afford them a nidus. The mammæ, the ovaries, and the uterus, are frequent sufferers; the lungs and brain are much more rarely affected. Certain parts of organs also are much more commonly attacked than other parts, as the pylorus and the epididymis, than the rest of the organs. Some organs, or parts of organs, are prone to be affected by certain growths in preference to others, as the mammæ, the stomach, the liver, &c. are most liable to be affected by cancerous productions; the bones to enchondroma; the neck of the uterus to cancer, in preference to the body of the organ, where fibrous tumours are chiefly developed; and the large intestines are very much more frequently the seat of cancer than the small.

97. *B. Sex* influences the site of growths. The female sexual organs are much more frequently their seats than the male organs; whilst the male urinary organs, especially the kidneys, are more frequently thus affected than the urinary organs of the female. *Age* has also considerable influence; certain epochs of life favouring the development of certain growths in preference to others. Some tumours often appear to be compatible, and others incompatible, with the co-existence of others. Dr. WALSHE remarks, that some growths, as cystoma and carcinoma, are sufficiently prone to appear in the same person; others, as fibroma and carcimona, are rare co-existences; none is actually incompatible, either as unconnected co-existences, or as developments in each other.

98. *C. The course* of tumours, or other morbid growths, topographically, is either *solitary*, *secondary*, or *multiplied*. — (*a.*) A tumour may remain solitary until the death of the person in whom it exists; no other organ or tissue than that in which it commenced being involved by similar disease. This occurs chiefly in respect of enchondroma, of cystoid tumours, and occasionally of fibrous growths.

(*b.*) *Secondary* growths arise by the spreading of the morbid structure from its original site to parts either *adjoining* or at a *distance*.— (1.) *Adjacent parts* are *secondarily* affected by infiltration or imbibition of the morbid matter from the site of preceding disease, a morbid mass thus gradually extending from the primary seat to circumjacent tissues, and co-ordinately enlarging. —(2.) Secondary growths in *distant parts* are produced by the transmission of the morbid matter by either the lymphatic or vascular systems. The matter, especially of cancerous and tuberculous growths, may sometimes be traced in the lymphatic vessels; and a lymphatic gland, in connection with a cancerous mass, not infrequently becomes cancerous also; and, although the morbid matter cannot always be detected in the communicating vessels, there can be slight reason to doubt this mode of transmission. These glands may, however, be secondarily attacked, independently of this transmission of the cancerous matter; but this can rarely be the case where the vessels proceed from the primary site to the secondarily affected glands, and, as transmission is demonstrated in some cases, it may occur in all. When parts far distant are secondarily affected, these parts manifesting no lymphatic connections, then it may be inferred that the secondary growth has either originated

independently of the primary one, or been produced by the transmission of the morbid matter from it through the medium of the veins, in which cancerous as well as other morbid matters proceeding from the primary seats of disease have been detected. (See arts. ABSORPTION, and ABSCESS, SECONDARY.)

99. (*c.*) *Multiplied growths* may exist primarily and independently of the transmission by the lymphatics or veins of morbid matters from pre-existing growths. The disease in distant and unconnected parts results from the constitutional morbid condition which thus manifests itself in sundry situations. This circumstance is often observed in cancerous and tuberculous maladies, and in cases of fibrous growths; and of cancerous diseases, the encephaloid, or fungo-hæmatoid, the most frequently manifests a multiplied origin.

100. V. DIAGNOSIS OF SCIRRHOUS AND OTHER MORBID GROWTHS. — The most important point of this part of the subject, is the distinction between tumours or growths which are truly cancerous, and those which possess a different structure, although resembling the former. Histologists consider, that "the local symptoms, and the general signs observed in individual cases have been found insufficient; such as the lancinating pains, unequal surface, hardness, elastic feel, softening, ulceration, the surrounding tissue being affected, a general alteration of the constitution and return after excision" and have been, at various times, absent in cases undoubtedly cancerous, whilst they have existed in growths the nature of which is doubtful, and often been connected with epidermic, fibrous, fatty, or cystic tumours, of the most innocent nature. That this difficulty exists in rare cases, — that the symptoms and signs of cancer have been absent in truly cancerous diseases, and have existed in cases of an innocent nature, may be admitted to have occurred in rare instances; but these have not — at least rarely or never — furnished opportunities of examining the morbid growths microscopically until both diagnosis and treatment have been equally of no avail, or even until they have come under the knife of the anatomist. And even were opportunities of microscopic investigation afforded, it is manifest from what is above stated (§§ 5, 6.), and from what has been advanced by the ablest histologists, that the diagnosis is by no means easy, even by the aid of the microscope. But I shall allow Dr. BENNETT to state the case in favour of this instrument.

101. "Symptoms alone, however, from their very nature, are apt to mislead, caused as they are by a variety of disorders which may affect an organ; whilst physical signs, once established and ascertained, are in conjunction with those of universal value. The only physical proof we can arrive at of the existence of cancer is by means of the microscope; not that this instrument is in itself capable, even in the most expert hands, of doing any thing; but, conjoined with a knowledge of symptoms, progress of the case, form and appearance of the morbid growth, it offers us an additional and most valuable means of prosecuting our inquiries. It is from an union of these circumstances, combined with a minute examination of the growth, under such magnifying powers as will clearly display its cells and other primary elements, that we ought to found a diagnosis, and not from one or the other separately." — (p. 222.) It is evident, however, from the admissions of MÜLLER and others, and even from what has been stated by Professor BENNETT, that the microscopic history of morbid structures is only in its infancy; that there still remains much to be known respecting it; and that the connections subsisting between vital power, vascular action, and morbid growths — connections of the utmost importance to the physician, in a therapeutical point of view especially — have been generally overlooked; whilst there has been much difference in the information furnished by those who have professed themselves to be observers, gifted with the greatest powers of microscopic research.

102. *A. The diagnosis of cancer* by means of the microscope, as already stated (§§ 100, 101.), can seldom be determined until the disease has advanced so far as to become quite manifest without this aid. Dr. BENNETT remarks, that wherever we see, in a morbid growth, cells including other cells, there can be no doubt of its cancerous nature; and that it is not by fixing attention on any one particular cell that we can discover a marked difference between it and a variety of others, but when grouped together we observe in different cells a variety in size and shape, some containing one nucleus, others two or three, and rarely more, and the nucleus containing one or two nucleoli. Such a group of cells is distinguished, — 1st. From groups of epithelial cells; — 2d. From fibro-plastic cells; — 3d. From pus and plastic cells; — 4th. From compound granular cells; — and 5th. From fat-cells. The difference of the cancer-cells from cartilage-cells is also easily ascertained before softening, but after softening, the diagnosis is more difficult; but even in this latter case, the action of water and acetic acid on the cells, and an examination of different sections of the growth, will assist the diagnosis. In all cases, the situation and characters of the tumours, and the concomitant circumstances and symptoms should be taken into account. Open sores, the ulcers formed on the tongue, lips, or faces on the genitals and os uteri, furnish the best occasions for microscopic diagnosis during the life of the patient; and even in these situations many difficulties will often occur.

103. It is interesting to add what Professor WALSHE has stated respecting this important matter. "A constant and unfailing microscopical characteristic of cancer has hitherto been vainly sought for; the following propositions will serve as a commentary on, and, in some sort, a justification of, the statement. — (1.) Parent cells, containing within them sub-cells having darker nuclei, and these, in turn, bright nucleoli, are strongly characteristic of cancer; but such cells are rare in, and may be altogether absent from, scirrhus; encephaloid, in some phases of its growth, may also be without them. — (2.) The shapelessly caudate cell seems significant of cancer; but it may be absent from encephaloid, and it is excessively rare in scirrhus and colloid. — (3.) A tumour may present to the naked eye the characters of encephaloid, be the seat of interstitial hæmorrhage, affect the communicating lymphatic glands, run in all respects the course of cancer, and nevertheless contain no cells but such as are undistinguishable, in the present state of our knowledge, from common exudation cells. — (4.) Nay, more, while a primary 'malignant' tumour alone contains these cells,

the lymphatic glands secondarily affected may contain compound nucleated cells, spherical and shapelessly caudate. — (5.) The granular and imperfectly nucleated cell of scirrhus is valueless as an evidence of cancer. — (6.) The true fusiform cell is an adventitious formation when it occurs in cancer, and has no diagnostic signification. — (7.) The association of fibre and cell-structure, which will distinguish scirrhus from fibrous tumour, may be totally wanting in encephaloid; and it exists in sarcoma and enchondroma. — (8.) If fat be associated in large quantity with fibre and cell-structure, the certainty that cancer is present becomes great, but not absolute.

104. "The property of infiltration, which serves well to distinguish cancer *from other growths* nosologically, fails practically in the distinction of tumours generally, because a true cancer *is not necessarily* infiltrated, and because tubercle and exudation-matter may be infiltrated. In ultimate analysis the *single* character least likely to deceive is this: — if a tumour be cancerous it will yield on pressure an opaque, whitish (milky or creamy-looking), albuminous fluid; if it be not cancerous, it will not yield a fluid of these qualities." — (*Cycl. of Anat. and Physiol.* vol. iv. p. 137.)

105. *B. Fibro-nucleated tumours*, or growths, distinguished by the presence of fibres amongst which are infiltrated naked nuclei, have hitherto been confounded with sarcomatous, encephalomatous, or osteo-medullary tumours. LEBERT considers this to be a peculiar form of fibro-plastic growth. Dr. BENNETT has observed but three or four instances of this tumour, and has viewed them as possessing marked peculiarities in structure, although presenting most of the appearances of those growths with which this has been confounded.

106. *C. Epithelial growths* generally commence in an induration or wart upon the skin or mucous surfaces, and are harder in the former than on the latter. Occasionally they appear as cauliform excrescences or condylomata, made up of elongated papillæ aggregated together, with their summits more or less flattened. In this condition their diagnosis is easy. Sometimes they soften externally sooner or later after their formation, and become covered with crusts of inspissated pus and epithelium. "This crust on separation leaves an ulcerated surface, presenting irregular clefts between the hypertrophied papillæ, the edge being everted and the base and margins greatly indurated. The ulcer may slowly spread over a considerable portion of the surface, and cause great swelling of the lymphatic glands from the irritation produced. In this condition such ulcers are usually considered to be cancerous." But the progress of an ulcer commencing externally in warty excrescences, spreading laterally, slowly, and proceeding from without inwards, is distinctly opposed to the progress of true cancer, which almost invariably is deep-seated at its commencement, produces ulceration consecutively by thinning of the integument, and throws out subsequently and rapidly fungoid masses. The progress of the case, the absence of cancer-cells, the microscopic appearance of the projecting papillæ, will establish the nature of the growth.

107. *D. Fibrous formations* cannot, at an early stage, be distinguished from scirrhous. Dr. BENNETT considers, that at their commencement they are both identical, and remarks that experience is daily showing the truth of this statement; and that the distinctions between them insisted upon in surgical works are illusory. When a hard knot or induration follows a blow or injury, it may result from a simple exudation; but it may nevertheless become cancerous; although this conversion is much less likely to take place in a young than in a cachectic or aged person. When more advanced, fibrous tumours are distinguished, by partial elasticity, smoothness, and regularity of surface, from the irregular nodosities and stony hardness of scirrhus, and the pulpy feel of encephaloma. But these symptoms are sometimes deceptive. So that at an advanced, as well as at an early stage, the diagnosis may be occasionally impossible. Dr. BENNETT advises a cautious use of the exploring needle and microscopic examination. When the latter can be obtained, the presence or absence of cancer-cells will decide the question. But the former, however cautiously employed, will often aggravate the local mischief, and prove of questionable utility as respects the results.

108. *E. Cartilaginous growths*, when occurring in the extremities connected with the bones, and surrounded by an osseous capsule, may readily be distinguished from cancer; but when they are deep-seated, covered by soft parts, and have no distinct bony capsule, their detection is very difficult. Enchondroma may thus be readily confounded with cancer of the bones, of which disease it presents all the general symptoms and signs; and, as already stated (§§ 66, 67.), if it be softened it is not easily separated from cancer by the aid of the microscope, even after excision. In doubtful cases, during life, a microscopic examination can be obtained only by means of the exploring needle, and even then it may be unsatisfactory. The progress of the growth is more distinctive, cancer of the bones being generally more rapid in its progress than enchondroma.

109. *F. Fatty tumours.* — "Simple lipoma and most encysted fatty tumours are readily distinguished from cancer, the first by their lobulated, and the second by their rounded form, together with their doughy feel and non-attachment to surrounding parts." A fatty growth may, however, assume all the symptoms and signs of encephaloma. SEDILLOT excised a fatty tumour from a man aged forty-seven. The growth returned twice after removal, and was excised the third time. It was considered to be encephaloid, from the local and constitutional symptoms and its return; and yet, on a microscopic examination, it was shown to consist only of adipose and filamentous tissue; and a chemical analysis proved it be almost entirely composed of fat.

110. *G. Tubercular growths* can rarely be confounded with cancer. They simulate it only when the glands are enlarged in youth, and at an age when cancer scarcely ever attacks the frame, unless in the form of encephaloma, or fungo-hæmatoid cancer. "Undoubtedly many of the so-called cases of cancer in the young are softened tubercle. The nature of the growth may be suspected from its cheesy consistence and absence of cancerous juice; while the differences between tubercle and cancer corpuscles under the microscope are so great as to be unmistakeable. The only danger is confounding tubercle with the reticulum of cancer, which it closely resembles, and

is a mistake that a critical examination of all the concomitant circumstances will alone enable us to avoid."—(BENNETT, *Op. Cit.* p. 229.)

111. VI. PROGNOSIS OF SCIRRHOUS AND OTHER GROWTHS.—i. *Of scirrhous or cancerous formations.*—Little may be added at this place to what I have stated when treating of CANCER (§ 11. *et seq.*), and FUNGOID DISEASE (§ 17.).—*A.* MÜLLER considers that *growths which are truly cancerous* when extirpated invariably return, and are inevitably fatal. Dr. WALSHE observes, that "cancer is not, as a matter of absolute necessity, a fatal disease; but the number of recoveries is relatively so small that, practically speaking, they are almost without numerical value, and may be excluded from consideration." Professor BENNETT states, that he can no more agree with the modified statement of Dr. WALSHE than with the unqualified one of MÜLLER; and remarks, that the established recoveries may be small in number, but their numerical value is altogether unknown in the present state of science. He believes, that a cancerous growth is for some time purely local; that indolent tumours exist in a female breast or elsewhere for years, without making progress, or causing much inconvenience, and after a certain time they often suddenly increase, and evince signs of malignancy; that a fibrous vascular tumour may exist, in the filamentous meshes of which a cancerous exudation may be afterwards infiltrated; and that in this indolent state, a tumour may often be discussed by suitable means, and, if excised, be permanently eradicated. These propositions may be conceded to Dr. BENNETT; they have been long received as practical doctrines, and long acted upon by both physicians and surgeons. Even when a growth has become undoubtedly cancerous, complete excision of it has been said to have been successful in a few instances; but still the actually cancerous nature of the tumour has not been satisfactorily established, for the histologists argue that it has not been determined by a sufficient microscopic examination. But even they admit, as stated above (§§ 100, 101.), that a microscopic investigation is not sufficient always to determine the fact; so that the imperfections, which they impute to the infancy of the science, may be admitted to belong to the nature of the subject—to the varying, ever changing, and constitutional relations of these growths—to the alterations which take in them under the influence of changes in the state of vital endowment and of vascular action, both of the growths themselves, and of the body in which they occur as parasitic or other productions. t is in vain to look for precise marks of demarcation, either in the diagnosis or in the prognosis, where none exists, and where every phase, grade, and form of morbid growth is observed, although in different cases; each of which phases and forms are continually undergoing further changes, and assuming varying local and constitutional relations. The histologists, after all they have observed and written, leave the subject of prognosis, as well as that of diagnosis, pretty much in the state in which they found it; for one of the latest and best writers in this department has remarked, that "in the present state of our knowledge, there is no possibility of pronouncing accurately whether an operation will be successful or not." (p. 233.)

112. ii. *The prognosis of morbid growths which are not cancerous* depends chiefly upon their situation and nature, and has reference to the probability of removing them by medical treatment, or by surgical means. The growth may appear in a situation which precludes an operation, or in which an operation or simpler mechanical means would be extremely dangerous, and where a recourse to medicine in order to arrest its progress, or to remove it altogether should be tried or chiefly confided in, although the chances of success from it may appear small. Adipose or fatty tumours, tubercular growths, and glandular enlargements, admit of a more favourable prognosis than others, and furnish the greatest number of chances of their removal by medical treatment. Dr. BENNETT remarks, with reference to operations for the removal of tumours, that "it is now well understood that not only cancerous, but the most innocent growths may return after excision. It is generally supposed, however, that in all such cases the second growth originates in some germ which had been left in the part. Hence it is of great importance to separate a recurrence in the seat of the former tumour, from that occurring in other places and textures. The former is not necessarily to be dreaded. Numerous instances are on record of fatty, fibrous, and encysted growths returning again and again, and finally extirpated with success." Epithelial growths also occasionally return, but enchondroma, according to MÜLLER does not. It should, however, be recollected that whilst truly cancerous growths generally return either in the same situation or elsewhere, non-cancerous tumours seldom return, even in the same situations, unless a portion be left behind, and when they return, they appear not often in other parts. Warty and encysted growths, may occur in several places; several fibrous tumours may exist in the body of the uterus; and neuroma may affect several nerves. Although cancer, after a time, extends itself to the lymphatic glands in the neighbourhood, the affection of these glands is not to be received as a proof either of the cancerous nature of the primary growth, or of a fatal tendency of the malady; for a non-cancerous growth may cause, but much more rarely, enlargement of these glands, owing to the amount of local irritation produced by it. When, however, this affection of the glands occurs, it indicates, even in non-scirrhous tumours, a much more serious malady, than when no such glandular affection is observed.

113. VII. TREATMENT OF SCIRRHOUS AND OTHER TUMOURS.—i. *The Treatment of Scirrhous Growths* I have considered fully in the article on CANCER (§ 27. *et seq.*); but there are a few topics which have been agitated since that was written which require a brief notice at this place. The means which Dr. BENNETT advises for the "*retardation and resolution*" of cancer are *cold, dryness, pressure* and *locality*; and these he views as the principal known measures by which we can hope to retard the production and growth of cancer-cells. He remarks that "a cancerous growth is a vascular structure, which consists of nucleated cells infiltrated among a fibrous stroma, and that its power of growth, extension, and redevelopment is dependent upon the amount of cells it contains. It follows, that to retard the growth of the cancer-cell when once formed, is to retard the advance of cancer itself, and that to render it unproductive is to arrest its progress." This

view appears plausible at first sight; and the means proposed are to a certain extent appropriate to the pathological doctrine entertained. But it is questionable how far the doctrine is sound, and to what extent the means are beneficial. As to the former, if it be conceded, that the formation of cancer-cells are the results of a low grade of vitality in the part — that cancer-cells, like hydatidic formations, are parasitic productions, proceeding from low grades of vital power and of vascular action, and, like all such productions, consequences of these states, the treatment here advised has reference merely to the morbid results, and has comparatively but little regard to the antecedent vital conditions, of which the cancer-cells can be viewed only as the products. In this instance, as in many others, the histologists would induce us to grapple with the morbid product, to the total disregard of the vital condition producing that product — to the entire neglect of those states of vital power and vascular action, upon which all morbid growths depend, whether parasitic, hydatidic, cell-formations or simple exudations.

114. Viewing, therefore, cancerous productions or growths as depending upon the causes, constitutional and local, which I have set forth in the article CANCER (§ 26.), — entertaining the doctrine there stated, and knowing that it is supported by the ablest and most experienced writers and observers, as well as confirmed by my own experience, I firmly adhere to this doctrine, and to the *intentions of cure* set forth conformably with it in that article (§ 40. *et seq.*), believing that they are the best calculated to enable the constitution to resist the inroads of the malady, to prolong life, and to give the patient a chance of throwing off, or resolving the local evil. The measures which have more recently been advised should not, however, be passed over without notice, although but little evidence of benefit from them has hitherto been obtained. Dr. BENNETT observes, that "all eggs and young animals require warmth to favour their growth, and maturity is reached earlier in the tropics than in temperate regions. In the same manner, excessive cold, dryness, want of room, and unfavourable position, are circumstances hostile to cell-development. But it requires no lengthy argument to prove the great influence of these agents on vital growth." Without disregarding this view of the subject, I would still insist upon the importance of the principle for which I have contended, both in the article CANCER (§ 26.), and in that in HYDATIDS (§ 24.), that these and all other parasitic formations encrease and multiply in proportion as the parent animal becomes weakened, and as the secretions and excretions accumulate, and that those formations are most disposed to diminish and ultimately to disappear, with the full restoration of the vital power, and with the healthy nutrition of the animal which produced them.

115. *A. Cold.* — Dr. BENNETT remarks respecting this agent, that "in a cancerous growth, the tendency of which is to excessive cell-formation, we evidently retard its advancement by the application of cold. Were it possible, indeed, to bring down the temperature of an entire growth below the vegetating point we must inevitably kill it; but, supplied as it is with heat through the warm blood within, this is impracticable. Still the external application of cold is one of the most powerful means we possess of retarding the progress of a cancerous or any other kind of growth." The beneficial agency of cold has, however, to be proved. If it be employed so as to promote and develop organic nervous energy and vital power, there can be no doubt of its proving more or less useful.

116. *B. Dryness.* — It has been supposed that, as the development of cell-formations depends upon a blastema or nourishing fluid, it follows, that, if this were cut off, the growth would die. In order to accomplish this intention, it would be necessary to tie the principal vessels nourishing the growth. This has been done by MAGENDIE, JOBERT, and HOSSACK, with partial success in some instances and with complete success in others: but it is doubtful whether or no the disease was cancerous in all the cases. Dr. HOSSACK applied a ligature on the carotid artery in two cases of scirrhus of the parotid gland. In one case the growth of the tumour was arrested, and the suffering of the patient relieved: in the other a complete cure was produced. Lotions and humid applications should be avoided, and those which produce a drying or absorbent, with an astringent, action ought to be preferred.

117. *C. Pressure* was first advised by YOUNG, and has since been adopted for the cure of CANCER (see § 37.) by several writers. Pressure acts, 1st, by diminishing the supply of fluids to the morbid growth; 2dly, by preventing the expansion and development of the cancer-cells; and, 3dly, by promoting the disintegration and absorption of the morbid growth. Dr. BENNETT remarks, that "pressure applied externally to so-called cancerous tumours has been pretty extensively tried, and been found successful, sometimes in retarding, and at others in altogether removing them." TRAVERS has seen cases of this kind; and RECAMIER gives the following results of the practice tried in 100 cases. He says, of these, "sixteen appeared to be incurable, and underwent only a palliative treatment. Thirty were completely cured by compression alone, and twenty-one derived considerable benefit from it: fifteen were radically cured by extirpation alone, or chiefly by extirpation and pressure combined; and six by compression and cauterisation. In the thirteen remaining cases the disease resisted all the means employed." Dr. WALSHE states that Dr. A. R. J. BAYLE, out of 127 recorded cases, gives 71 cured, 26 improved, and 30 unaffected. These results are certainly much more favourable than could have been obtained from the treatment of the several kinds of scirrho-cancer; and I would therefore infer, either that the favourable results have been prematurely reported, or that cases actually not cancerous have been confounded with the cancerous.

118. Dr. NEIL ARNOTT has greatly facilitated the employment of pressure by the invention of an instrument for this purpose; and which has been described by Dr. Walshe. It consists of a spring, an air-cushion, supported by a flat resisting frame or shield, a pad and two belts. It does not interfere with the movements of the thorax, and the amount of pressure can be nicely regulated and equably applied; causing great relief from pain, and restraining hemorrhage in ulcerated cases. It has proved useful in cases in which

I have seen it resorted to. Dr. BENNETT remarks, that, if pressure alone be capable of producing such good results, its conjunction with one or more of the other means capable of retarding growth may be attended by even greater utility; and thus the apparatus invented by Dr. J. ARNOTT, by means of which pressure may be combined with external cold and dryness, is directly indicated, and deserves to be tried; or his apparatus, applied when the patient is at rest, may be alternated with that of Dr. NEIL ARNOTT when exercise is desirable. I believe, however, that pressure will be found most efficacious when conjoined with those measures which are the best calculated to improve the general health, and to enable the vital power to throw off the parasitic formation. (See art. CANCER, § 40. *et seq.*)

119. *D. Locality* has been shown, in the article CANCER, to have considerable influence in favouring the development of this malady. Cold, humid and malarious situations, unwholesome food, insufficient nourishment, and mental anxieties and depression, are amongst the most influential causes of scirrho-cancer. Therefore a choice of locality, and with reference to season, prevailing winds, and exposure, should be made with due care; a dry, moderately warm and bracing situation and air being selected. A clay soil, or a low alluvial, wet, and swampy soil should be avoided, even to a considerable distance; and food, exercise, and the regimen of both the body and mind should be such as are most calculated to give due tone to the former, to refresh and agreeably engage the latter; interesting occupations being calculated to promote both intentions, whilst the want of occupation leaves the patient a prey to ennui and to his own depressing anticipations, or his still more lowering fears.

120. *E. Excision.* — The propriety of excising tumours, from a belief in their cancerous nature, or dread of their assuming this nature, or as the best mode of removing them, has been much discussed by both physicians and surgeons, especially in recent times. It may have been supposed that the discoveries of the histologists would have gone far to determine the question of excision, in as far as the nature of the growth may be concerned. But they have left the matter pretty much in the same state as that in which they found it. Professor BENNETT, after alluding to the discussion on this subject, and the differences of opinion expressed by the most eminent surgeons of Paris, remarks that "a knowledge of the structure and natural progress of cancerous and cancroid growths must in future exempt surgeons from the doubt and difficulty they formerly experienced. At the same time it cannot be denied that considerable obscurity still hangs over our knowledge of the pathology of cancer, and that there are no means of diagnosing a cancerous from fibrous and other forms of cancroid growth at their commencement. It seems to me certain that a cancerous may supervene upon a cancroid growth, and that both for a time may be local, so that, under all circumstances, where the nature of the tumour is doubtful, after means of retardation and resolution have had a fair trial, excision should be at once had recourse to. As there is no possibility at an early period of knowing whether the growth may or may not ultimately become cancerous, prudence demands that *as soon as it becomes evident that these means have failed to arrest its progress*, an operation should be performed. If *early* excision were more practised, many of the lamentable cases which occur would never appear." (*Op. Cit.* p. 242.) This is sound advice; and the same eminent physician further remarks: "The practical rule, then, which pathology and experience unite in causing us to adopt, seems to be this, *that so long as cancer remains fixed in a part which is capable of being removed, and the strength of the patient is not too much reduced, so long is the surgeon warranted to interfere.* If this applies to cancerous, it does with tenfold force to cancroid growths, which, every thing that we know, warrants us in asserting, are much less fatal and malignant." (*Op. Cit.*, p. 245.)

121. *F. Chemical applications, &c.*—The destruction of morbid growths by various cauterising or dissolving applications, can scarcely be accomplished unless at very early periods of their production; and, as regards cancerous formations, these applications would increase rather than arrest the disease. Dr. BENNETT remarks, that "Acetic acid dissolves the cell-wall more or less, and strong potash reduces the whole to a granular mass. The continued application of these agents, therefore, would tend to dissolve if brought in direct contact with the cells, and need not necessarily excite such irritation as to cause fresh exudation. The only objection is, the utter impossibility of affecting the whole mass, even in cases of ulceration, and preventing the formation of deep-seated cells, while the superficial ones are destroyed. In certain cancroid growths, especially epithelial ones, the application of acetic acid is an established remedy, and should always be tried when it is thought possible to bring the fluid successively in contact with the entire mass of the disease." (p. 250.) The external application of the chloride of zinc has been advised, and of iodine, and of several of its preparations. Probably the application of an iodide of zinc may deserve a trial.

122. *G. Internal Remedies.* — Before excision is attempted, and often contemporaneously with a judicious recourse to external means, several internal remedies, either singly or variously conjoined, may be tried, more especially those which tend to promote the digestive, assimilative, and depurative functions, and to develop the powers of life. As respects cancerous growths, this principle of treatment has been fully insisted on (see arts. CANCER, § 40. and FUNGOID DISEASE, § 21.), it therefore only remains briefly to notice the importance of adopting it in our attempts to remove other morbid growths, especially before the constitution is subjected to the shock of an operation; and in cases where the situation of a tumour or other circumstances may render the success of an operation either extremely improbable or impossible. In three cases of large tumours, — one seated superficially, evidently a fatty tumour, and about the size of a person's head, the others seated very deeply amongst the muscles of the upper half of the thigh, — and in one case of tumour, apparently attached to the pericranium, a course of internal medicines entirely removed the disease. I had advised a recourse to surgical aid, but the patients having been desirous of trying medical treatment before any surgical means were adopted, a course of the medicines about to be

mentioned was prescribed, very nearly the same substances having been employed for the four cases. Those cases occurred some years ago; but the persons who were the subjects of them had not, up to recent periods, experienced a return of these growths. The medicines which were prescribed consisted chiefly of the Iodide of potassium, conjoined with solution of potash, the decoction or compound tincture of cinchona, the internal use of tar-water, and the fluid extract or other preparations of sarsaparilla, with due attention to diet and to exercise in the open air. When treating of CANCER (§§ 34—41.), the propriety of prescribing the preparations of *iron* was insisted upon, especially in such combinations as the peculiarities of the case would suggest; and the *iodide of iron* was then for the first time recommended in the treatment of cancerous diseases. This medicine has frequently been given by me in these maladies with sarsaparilla, or dissolved in the syrup of sarza with more or less benefit; and the *nitro-hydrochloric acids* have been sometimes prescribed with vegetable tonics, or bitter infusions. Considerable advantage has been derived, in several cases, from the use of inspissated *ox-gall*, as recommended in the first part of this work, and prescribed in numerous and varied formulæ in the APPENDIX which accompanied that part, more especially in correcting and promoting the functions of the digestive canal. *Conium*, and other narcotics, formerly much praised for cancerous maladies, have rarely proved of advantage beyond the temporary relief to pain, or to other urgent symptoms they have sometimes afforded.

123. *H. Diet and Regimen.*—These require to be adapted to the temperament, diathesis, habit of body, and other circumstances of the patient, as well as to the presumed nature of the tumour. When treating of CANCER (§ 44.) I mentioned the advantages generally derived from attention to the secretions and excretions, and from promotion of the primary and secondary assimilating processes. There can be no doubt of the good effects of moderate exercise in the open air, of a residence in a mild dry atmosphere, and of pleasant occupations, with a cheerful state of mind. But the nature of the food admits of much more discussion. In the cancerous or scirrhous forms of morbid growth, the adoption of a farinaceous and vegetable diet has been advised by Dr. LAMBE and a few others. I have seen this diet most beneficial in a case which was considered cancerous disease of the os and cervix uteri; but the patient enjoyed at the same time the advantages of removal to a good air; and her sanguine temperament and full habit of body favoured the change of diet. When, however, the patient is of the melancholic, lymphatic, or nervous temperature, or if anæmia or a cachectic habit of body be manifest, I believe that a judicious combination of animal with vegetable food, and the promotion of the assimilating and excreting functions, are most beneficial. In all cases of a malignant or contaminating nature, and in all cases which are likely to assume this nature, the chief indication of treatment is to enable the vital energy, by the aid of diet, air, and exercise, to resist the extension of the local evil, and to favour its transformation or resolution.

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SCROFULA AND TUBERCLES. — SYNON. — *Struma*, Celsus, Pliny, Linnæus, Good; — *Scrophula* (from Scropha or Scrofa, a pig or sow), Sauvages, Vogel, Sagar, Cullen, Macbride, Darwin, Young; — χοιρὰς, Hippocrates; — *Scrophulæ*, Pinel; — *Scrophulosis, Scrophulosus Morbus, Vitium Scrophulosum*, Dunglison, — *Cachexia Scrofulosa, Adenosis Scrofulosa*; — *Glandes, Strumes, Ecrouelles*, (*Cruels*, Scotticè) Fr. — *Kropf, Skropheln, Skrofelkrankheit*, Germ. — *Scrofula, Scrofole*, Ital. — *Scrofula, the King's Evil, the Evil*. — *External Scrofula or Struma*.

TUBERCLES. — *Tuberculum*, (from tuber, a tumour); *Tuberculosis, Morbus tuberculosus, Strumosis*, — *Cachexia tuberculosa, Dyscrasia tuberculosa*, — *Diathesis seu Constitutio Strumosa; Tubercular or tuberculous Cachexy, Diathesis, or Vice, &c.* — *Internal Scrofula or Struma*.

CLASSIF. — 3d *Class*, Cachectic Diseases: — 3d *Order*, Impetiginous Affections (*Cullen*): — 3d *Class*, Diseases of the Sanguineous function: — 4th *Order*, Cachexies, (*Good*): — CLASS IV. ORDER I. (*Author in Preface.*)

1. DEFINIT. — *Constitutional asthenia; a weak or an atonic development of the frame, with a flabby state of the soft solids and predominance of cellular and lymphatic conformation; and a dispositum to, or the presence of, swellings of the lymphatic glands, of disorder of the mucous surfaces, and of deposits, in various organs or parts, of small masses, varying in size, consisting of a firm, friable, inelastic substance resembling cheese, and denominated tubercles.*

2. From the *synonymes* enumerated above, it may be inferred that the terms *Scrofulous diathesis*, or *cachexy*, or *vice*; *Strumous taint* or *constitution*; *Tuberculous cachexy* or *evil*, *Tuberculosis*, *Scrofulosis*, may be considered as nearly synonymous, although the scrofulous taint or cachexy may be viewed as sometimes existing without the tubercular deposit being yet formed, this deposit, in some one or more of its numerous seats or manifestations, being the common structural change resulting from this taint — resulting so generally as to render it doubtful whether or not this taint ever exists without the tubercular formation being present in some situation or other, either in a developed or in a rudimental and latent form. *Scrofulosis* and *Tuberculosis* will, therefore, be considered by me as nearly synonymous — as very nearly allied, if not identical morbid conditions; the former, however, being more frequently applied to the *external* manifestations of the constitutional taint or diathesis, the latter more generally to the *internal* structural changes. I am aware that this opinion is different from that supported by SCHÖNLEIN, SCHARLAN, Dr. EVANS, Mr. PHILLIPS, and M. LEGRAND; but I believe that their doctrine will, in this respect, be considered incorrect, after the consideration which will be given to it in the sequel. In discussing the subject of *Scrofula* and *Tubercules* I shall follow this arrangement: —

3. i. *Of the Scrofulous diathesis or taint* — *Latent or inactive Scrofula*: — ii. *The Causes of*

Scrofula and Tubercles: — iii. *The Structure and Composition of Tubercles:* — iv. *The Pathology of developed, open or manifest Scrofula and Tuberculosis:* — v. *The Pathogenesis of Tubercles:* — vi. *The Comparative Pathology of Tubercle:* — vii. *The Scrofulous Taint as predisposing to, and influencing the symptoms, course and Terminations of various diseases:*—viii. *Diseases attack the Scrofulous diathesis, without being essentially scrofulous or tubercular, although more or less nearly allied to Scrofula:* — ix. *The associated alterations and complications of Scrofula and Tuberculosis:* — x. *The Prevention of Scrofula and Tubercles:* — xi. *The Treatment of Scrofula and Tubercles.*

4. I. INDICATIONS OF THE SCROFULOUS DIATHESIS OR TAINT.—The *Strumous* or *scrofulous taint* was no further recognised by the ancients than in connection with swollen external or lymphatic glands, the constitutional vice being overlooked until the writings of FERNEL, PLATER, BAILLOU, and others, directed attention to a more correct pathology of the disease. More recently numerous writers have furnished interesting information respecting Strumous affections, especially HOFFMANN, HUBER, VAN SWIETEN, LALOUETTE, HUFELAND, and HECKER; and, in the present day, the writings of CARSWELL, GLOVER, PHILLIPS, BENNETT, WALSHE, TYLER SMITH, and others, are especially deserving an attentive perusal. Dr. GLOVER very justly remarks that "a careful distinction should be made between the scrofulous diathesis, or predisposing constitution, and the actual processes of the disease, — between the *Ens in potentia* and the *Ens in actu*." The scrofulous diathesis may, by the debility or the susceptibility accompanying it, predispose to other diseases besides those which are more strictly strumous or tuberculous; and a distinction should therefore be drawn between the latent or inactive scrofulous taint, the diseases which are not strictly attributable to this taint, and those maladies which are actually the structural manifestations of it. But is this distinction readily drawn? I believe not; and that the descriptions and distinctions adduced by HUFELAND, LLOYD, LUGOL, and many others, are so loose, and present so numerous exceptions, that they deserve, in many particulars, but little credence, and certainly some of them at least require a more particular investigation. Several of these have been subjected to a minute examination by Mr. PHILLIPS; but, as he considers tubercles to be distinct from scrofula, much of his reasoning on this subject fails in strictness of application to the subject in the wider signification which I have assigned to scrofula. M. LUGOL assigns so many indications of the scrofulous diathesis, and those with so little justice and precision, as to have it remarked, that, of all his characters of this diathesis, there is not one which may not, with equal value, be replaced by a phenomenon diametrically opposed to it; yet this is one of the writers who is so much praised by the Gallic school in this country. Of the various indications of the scrofulous taint enumerated by this and other writers, many will appear to the experienced writer as possessed of little signification and dependence, and as deserving of very slight consideration.

5. *The chief characters of the scrofulous taint* enumerated by writers are the following: — (*a.*) A want of due bodily symmetry; small, weak, or crooked limbs; a gibbous or pigeon breast and flattened ribs; hare lip (BREDOW); hypertrophy of the pubis, the sacrum and the ischia (LUGOL): — (*b.*) A certain character of the head and face: the jaws are said to be broad, the forehead low and angular, and the neck long and rounded; a head larger than natural, especially posteriorly; a puffed up rounded visage; great transparency or whiteness of the skin, often with a rosy-tint of the cheeks; "a pale, inflated countenance; the chief colour of the dark complexion is dull or dirty, of the fair an unnatural whiteness, frequently with an agreeable redness of the cheeks; in others a waxy yellowness, with a dirty pallor round the mouth." (BREDOW.) Bluish rings round the eyes; the eyes most frequently large, oftener blue than dark; the pupils are commonly large; the tunica albuginea of a pearly whiteness, traversed by injected blood vessels, especially if the mesenteric glands are affected (HUFELAND), or of a bluish whiteness, and the pupils large when the lungs are diseased. The eyelids are often œdematous, the eyelashes are long, the Meibomian secretion is increased. The nose is wide or swollen, or red or shining; the upper lip is thick and projecting, and the furrow between it and the nose is deep. The general expression of the countenance indicates indolence and want of energy. The first teeth are small and subject to caries. The second are broad, often covered by a glairy secretion, are very white, readily split, and often become carious.

6. (*c.*) The appetite is irregular — sometimes impaired, at other times voracious; occasionally there is nausea; the tongue is often foul, the breath fœtid or sour; the bowels are irregular; flatulent eructations are frequent and acid; and the excretions are also acid. The abdomen is large, tumid and flatulent on percussion. Discharges from the nose are common, and from the vagina not unfrequent. The soft solids are flabby; the adipose and cellular tissues abundant but soft, giving the surface of the body a full and rounded contour; the limbs are deficient in rigidity and firmness. The tendons are small and yielding; the capsules of the joints are weak; and the heads of the long bones are large. Hence a disposition to lateral curvatures of the spine, thick ancles and joints, large ill-formed hands and feet, and falling of the arches of the latter. The shoulders are high.

7. (*d.*) According to HEUSINGER, one of the correctest writers on Pathology, the strumous taint consists of a torpid state of the nervous system. The *blood*, whose condition is yet but little known, appears to be, from the commencement, poor in globulin and hæmatin, rich in albumen, which, at a later period only, diminishes also. There are abundance of lymph, extension of the lymphatic vessels, marked development of the lymphatic glands, and predominance of the cellular system, not only under the skin, but in all the organs, where it commences to replace the specific tissues, which is especially apparent in the muscles, the bones, &c. All the mucous secretions are augmented, and they often become albuminous.

8. (*e.*) General lassitude, languor, and debility are commonly experienced, with an inability to sustain prolonged physical and intellectual exertion. The powers of the mind, although generally feeble, are often precocious. DR. GLOVER

remarks that, in very few of the subjects which he had examined, has he found the bodily or intellectual powers fairly developed in a degree proportionate to the age and circumstances of the patient; and that a general retardation of development seems one of the most constant features of this peculiarity of constitution. According to HUFELAND and FISCHER the generative functions are early and powerfully manifested. They may be early and frequently, but certainly not powerfully exerted. LUGOL maintains that these functions in scrofulous subjects are below the average.

9. (*f.*) All that is known of the *Blood* of scrofulous persons has already been stated (§ 7.). The *Urine* has been described by SIMON and others to be usually very pale, unless vascular excitement be present. Its specific gravity is low, and in children it is more acid than usual. There are differences of opinion as to the nature of the free acid; some consider it phosphoric acid, others hydrochloric acid, and others, again, lactic acid. The urea and uric acid are often diminished, whilst the salts, especially the phosphates, are increased; and even oxalic acid—an acid foreign to normal urine—has been found in the urine of strumous children. According to SCHÖNLEIN the chief alterations observable in the urine of scrofulous persons consist in the diminution of nitrogenous constituents—the urea and uric acid; and in the appearance of the non-nitrogenous oxalic acid, and more rarely of Benzoic acid. The acids are frequently so abundant that the urine, upon cooling, deposits copious sediments of the oxalates, and these sediments sometimes form renal and vesical calculi. The frequent occurrence of oxalate of lime or mulberry calculus in children is well known.

10. (*g.*) The observations of Mr. PHILLIPS on the characteristics usually assigned to the scrofulous taint are not devoid of interest, although open to the objection already noticed (§ 4.). He states that, in many "instances, most of the alleged characteristics of the scrofulous constitution may distinctly exist, whilst no strumous deposit takes place, and in others, diseases ascribed to the strumous habit may take place in persons in whom the marks alluded to cannot be recognised." In addition, however, to most of the indications which have been enumerated, Mr. PHILLIPS notices others, which characterise also this diathesis, namely, a want of muscular development; an hypertrophied or infiltrated condition of the cellular tissue, which rapidly disappears under privation or disease; a pallor and coldness of the surface, owing to a feeble circulation; a marked disposition to disorders of the respiratory and digestive mucous surfaces; frequent soreness of, or discharges from, the nose, the eyes, and the ears; enlargement of the tonsils; the frequent dryness of the skin, or a greasy, sour, or fœtid exhalation from the skin; and more or less disorder of nearly all the abdominal secretions and excretions.

11. (*h.*) The colour of the hair is very variable; but for the most part it inclines, according to Mr. PHILLIPS, to a dark tint. Of nearly 9000 scrofulous children he found a little over 32 per cent. had light hair and eyes. BARTHEZ and RILLIET state that, of 314 tuberculous children, the hair was fair in 150, red in 4, chesnut in 71, black or dark in 40, and not observed in 49. Dr. GLOVER remarked that, in 126 cases, 86 had fair hair and eyes, and 40 were of a dark complexion; and that in some workhouses, 97 cases had a light, and 47 a decidedly dark complexion. Mr. PHILLIPS remarks, that "the alæ nasi may be broad, but for the most part they are not so. The upper lip or even both may be tumid, but in the majority of cases they are not so. There is not, as some have supposed, any thing constant in the shape of the lower jaw, or in the appearance of the teeth." He observes that the scalp and other parts of the integuments are often the seat of eruptive affections.

12. (*i.*) It is obvious from the above, that the strumous diathesis may be viewed as an original or an acquired deterioration of the constitution from the natural healthy pitch or condition,—and that, before any actual manifestation of disease takes place, there may long exist such a state of organic nervous power, of circulation, of function, and of nutrition,—of general asthenia, and of deficient structural development, as to constitute an obvious and wide divergence from health, before the scrofulous formation or tuberculous deposit takes place,—and, moreover, that the characters now described, as constituting the scrofulous taint, cachexy, or divergence from the actual healthy condition, may exist for many years, or throughout a long life, without being followed by any of the marked structural manifestations of strumous disease or tuberculous deposit, although many determining or concurring causes very easily develop these diseases, in very active and manifest forms.

13. II. OF THE CAUSES OF THE STRUMOUS TAINT AND OF EXTERNAL AND INTERNAL TUBERCULOSIS.—The *Causes* of scrofula have been investigated with much assiduity by Mr. PHILLIPS, but chiefly with reference to the external forms of scrofula, and, as observed, in young subjects. The limitation which he has assigned to the disease—the exclusion from his calculation of the tubercular or more internal states of struma—impairs or even altogether destroys the value that he has assigned to each of the causes he has investigated; and therefore they must be estimated either with reference to this limitation, or more loosely in the extended acceptation in which I have received the term. Mr. PHILLIPS remarks that "hereditary influence, syphilis, bad air, bad food, and a cold and damp atmosphere, are the causes to which have been most frequently assigned the production of scrofula. The error of each theory is its exclusiveness; and when we reflect upon the difficulty of estimating the unmixed influence of any single cause, and when it is made probable that many causes are in action, we can scarcely comprehend how it happens that able enquirers should maintain, with so much pertinacity, not alone the efficiency but also the universality of one." When describing the *ætiology of* DISEASE (see §§ 7—62. of that art.) the combined, the concurrent, and the determining operations of several causes were insisted upon in the production of the morbid effect; and this associated action has been duly recognised in the causation of most diseases, the one now under consideration certainly being no exception. The difficulty of estimating the influence of any one of the several causes which usually co-operate in producing a disease is certainly great, and is owing

to circumstances which are more or less obvious. It has been attempted by certain writers to confer an arithmetical value on each particular cause, and the attempt has been followed by some in this country. But the nature of the subject, the varying influences of seasons, weather, localities, social and moral conditions, and numerous concurring and intercurrent agencies, render such precision unattainable, even if the requisite data, at given periods, could be obtained with due certainty; the attempts which have hitherto been made being characterised by more manifest errors than have distinguished even the loosest descriptions of much less ambitious writers.

14. The author now mentioned justly observes, that the difficulty of estimating "the force of any of the so-called causes of scrofula is owing to the fact, that the opportunity of observing a single agent in action alone is very rarely afforded: where one cause exists another is, almost certainly, intimately associated with it; and to assign to each its proper influence is rarely possible. This is particularly the case with bad food, bad air, and bad clothing; the existence of the one almost implies the presence of another." Nevertheless the attempt to estimate aright the influence of individual causes should not be neglected, when it can be made with a reasonable hope of success. And that it may be made with success, the following instances will show: — 1st. In a large charity school, of considerably above 100 girls, cases of scrofula became remarkably prevalent, notwithstanding a sufficient supply of wholesome food and clothing, and attention to ventilation, and treatment produced no benefit. During my duties as a visiting trustee, I ascertained, that the wooden floors of the sleeping and other apartments of the institution were washed daily. I contended, in the committee managing the charity, that this was the cause of the disease, and advised dry-rubbing; and that washing the floors should be adopted only on requisite occasions. This advice was followed, and the cases under treatment soon recovered, and no new case occurred. 2d. In a large school of boys, scrofula, both external and internal (tubercular), was of frequent occurrence, several of the parents having removed their children, not unfrequently during advanced or incipient tubercular disease. Having been sent to one of the children, I could find no fault with the food and exercise of the pupils, nor with the beds and cleanness of the apartments. But the sleeping apartments were much too close — too crowded and ill ventilated. Upon the removal of the cause, the school became remarkably healthy. Now, in these instances, the causes just named could not be disputed as having been the most active; most probably, however, various predisposing causes having existed, especially hereditary constitution, as respected the individuals affected.

15. The *causes of scrofula* have been variously arranged by writers. Some have viewed them as *predisposing* and *exciting*, others as *hereditary* and *occasional*. I shall notice, 1st. *Those which depend upon one or both parents*; and, 2d. *Those which change the constitution of the individual, especially during childhood, and which are independent of the constitution of the parent*; both classes of causes often concurring to produce one or other of the morbid results, usually termed scrofulous, strumous, or tubercular,—or external or internal scrofula.

16. i. CAUSES APPERTAINING TO ONE OR BOTH PARENTS. — *A. Hereditary constitution or Predisposition.* The operation of this cause has been much over-estimated by LUGOL, and many other writers, and as much underrated by LOUIS, HENNING, BAUDELOCQUE, PHILLIPS, and others. The circumstances which chiefly occasion this difference of opinion are the confounding of hereditary and congenital transmission of the disease with hereditary diathesis or constitution, and inattention to the fact that the parent or parents, who possess only the latent diathesis, may have children with the external signs of the disease in childhood, or with tubercular or internal scrofula at any future period of life, or with both manifestations of the disease; or that a parent affected with either the one or the other may have children presenting no indication of the malady, beyond the latent diathesis, which, however, may be very obscure, or altogether absent, or may have an offspring affected by a different form of the disease from that of the parent. Let any observer of experience refer to what must be familiar to him, and he will find, what I have often remarked, that one parent possessed of the scrofulous diathesis has passed on to the age of sixty or upwards, and has at last died of tubercular consumption, the other parent being of a sound and strong constitution, and either one or more of the offspring have had forms of external scrofula, before puberty, or have grown up and been carried off by phthisis in after life; or have been affected both before and after puberty — some with external, some with internal scrofula. I have known many such occurrences, and even instances where the scrofulous diathesis, either latent or manifested by active disease, existed only in one parent, and yet, of numerous families, part died in early life, with external signs of scrofula, as well as internal disease, and the rest, or the majority of the survivors, became consumptive at various ages, more or less advanced. Now, Mr. PHILLIPS and other writers, who consider tubercles a distinct lesion from scrofula, keep out of their calculations the former, and consider the one to have no hereditary connection with the other — a position which is altogether overturned by the numerous facts which are identical with the statement I have now made, the faithfulness of which is open to the investigation of every observer.

17. It is unnecessary for me to enumerate the authorities who have contended for the hereditary character of scrofula and tubercles — for the possession by the offspring of the diathesis or constitution of the parent or parents, more or less, or in one or more instances, and therewith the disposition to the same disease to which the latter was most liable. But, without regard to authority, let the matter be made one of observation, respecting which common sense is sufficient to judge. Mr. PHILLIPS remarks, that after reading the essay of PORTAL on "Hereditary diseases," he rose up in doubt, whether, in the strict sense in which alone he thinks the question should be regarded, there be clear evidence that almost any disease is hereditary, though with respect to syphilis and small-pox the proof may be sufficient. Certainly much of the difference of opinion respecting the hereditary nature of diseases

depends upon the signification assigned to the term. No one at the present day considers that the offspring is born with the disease which afflicted the parent, although even this is the case in rare instances; but only that the constitution or diathesis is inherited, and with it the disposition to the same diseases which attended it in the parent or parents. This subject is, however, sufficiently discussed in the article Disease (see § 11. *et seq.*).

18. (*a.*) *May the parent transmit scrofula or tubercles to the fœtus?*—Scrofulous tumours and tubercles have been observed in the fœtus and in very young infants by Dupuy, Andral, Chaussier, Billard, and a few others. The instances in which they have been found are few, and the connection of these cases with disease of the parents has not been shown in the majority of them. In three instances, in which the mothers died of consumption very soon after delivery, I found the lungs of the infants studded with tubercles, in the first stage, a few having advanced to the second stage. The infants were remarkably emaciated, had cough very soon after they were born, and died in a few days. In these three instances, tubercles of the lungs of the fœtus were expected during the gestation of the parent, by the practitioners in attendance (Mr. Nicolson and Mr. Winstone), as well as by myself, and in each case the mother considered the child to have been born with the same disease as that with which she was afflicted.

19. (*b.*) *To what extent may scrofula and tubercles be viewed as hereditary?*—The statistical or numerical writers on this subject have mystified and misled many who pin their faith to authority and numbers, without inquiring into the data upon which their calculations are based, or into the meaning of the terms they employ. One of the most recent numerical pathologists, having defined and limited scrofula to be "enlarged cervical glands discovered by the touch or sight, sinuses or ulcers succeeding to such glands, scrofulous bones or joints, or the consequences of them;" and at another place having further limited his definition to "disease of subcutaneous lymphatic glands," gives the results of his examinations of 7587 children, and found nearly 23 per cent. of these bearing such marks of scrofula. He further ascertained that, of 2021 children whose parents were both *untainted*, 21 per cent. presented marks of scrofula; that of 1092 children, whose parents were both *tainted*, nearly 25 per cent. presented marks of scrofula; that of 2107 children whose father only was scrofulous, nearly 23 per cent. had marks of the disease; and that of 2367 children, whose mother bore the marks of scrofula, whilst the father did not, nearly 24 per cent. presented signs of the distemper. Thus all that statistics here furnishes in favour of the hereditary influence of the scrofulous diathesis, is not quite 4 per cent.; and many believing in the precision and truth of numbers, would consider the evidence here adduced as most conclusive and incontrovertible. But, of the children thus examined—their ages probably being from two to sixteen years—the lymphatic glands may have been enlarged, and returned to their healthy state before the examination was made, or either these glands or some other parts may have presented evidence of scrofulous change *after* the period of this examination; and taking the more enlarged signification generally adopted, some internal organ may have become affected by the disease, either before or after puberty. It is not only external and palpable scrofula which is caused by the scrofulous taint, but also various internal maladies which are actually scrofulous or tuberculous in their nature, and which may be developed into an active state at any period either before or after puberty, an examination, on a single occasion, of numbers thus circumstanced, detecting a few merely from among them with the fully developed or manifested malady.

20. But Mr. Phillips does not stand alone in his scepticism of the generally received doctrine of the obvious hereditary nature of scrofula, and in his faith in statistics, for Louis, the apostle of the numerical method in medicine, states, with reference to phthisis, that in reality he had observed nothing decisive in favour of the hereditary character of that disease; and, in another place, that he had not collected any fact in favour of the hereditary nature of phthisis! But there is one circumstance connected with the hereditary nature of scrofula to which the numerical pathologists have paid little or no attention; namely, that the parent or parents may possess the scrofulous taint without any mark of the external or internal disease, and have one or more children which are either affected with open scrofula in childhood, or attacked with phthisis in early life; and even that one or both parents of a scrofulous diathesis, without any developed disease, may have children, whose lymphatic glands or bones become tuberculous in early childhood, or whose lungs are thus diseased after puberty, and yet may not be the subjects of manifest strumous disease throughout life, or not until a far advanced period. In these circumstances the hereditary tendency would not be detected or reckoned by those who employ figures as their arguments, and thus their statistics would be vitiated, or rendered by this and other sources of error altogether worthless. That the hereditary character of scrofula and tubercles has been exaggerated by some writers may be admitted; but that it is so low in amount as some recent writers contend, or even nearly so low, will not be demonstrated by future observers who shall view all the circumstances and facts connected with the subject with due accuracy.

21. Of 80 cases observed by Dr. Glover, the predisposition to tuberculous affections—to scrofula in the sense in which I have viewed it—was hereditary in 42; very few of the remainder furnishing clear evidence of the transmission. There appears some reason, he adds (and I agree with him), to conclude "that the popular idea of evidence of the family taint often passing over one generation, or appearing in the uncles and aunts, while the parents are free from the disease under which their offspring labours, may not be incorrect."

22. The hereditary predisposition is, according to my own observation and that of several others, more frequently derived from the mother than from the father, although the difference is not great, much depending upon the causes in operation in early life. The mother of nine children—six females, three males—had early signs of external scrofula; four of the female offspring died of phthisis between the ages of 20 and 30, and one of the males. All the children of the two remaining

females are possessed of the scrofulous taint, and about one third of them have external scrofulous disease. Dr. PRITCHARD has justly remarked, that all original connate bodily peculiarities tend to become hereditary, while changes in the organic structure of the individual, from external causes during life, commonly end with him, and have no obvious influence on his progeny. There is no doubt of the strumous hereditary taint having disappeared from families, especially when it existed only on one side, more particularly when the mother was strong, healthy, and suckled her own children, and when the latter were placed in favourable circumstances in childhood and early life as respected air, locality, ventilation, exercise, and food.

23. *B. Diseases of the parents.* — It has been justly remarked by Sir JAMES CLARK, "that a state of tuberculous cachexia is not the only morbid condition of the parent which entails the tuberculous predisposition on the children; there are several diseases which have this effect, the most important of which are a disordered state of the digestive organs, gout, cutaneous diseases, the injurious influence of mercury on the system, debility from disease, age, &c. In short, a deteriorated state of health in the parent, from any cause, to a degree sufficient to produce a state of cachexia, may give rise to the scrofulous constitution in the offspring." This opinion has been questioned by Mr. PHILLIPS, but I believe it to be in the main correct. Not, however, that parents thus circumstanced necessarily have children who became scrofulous in childhood, or tuberculous subsequently; but that the children of such parents are much more liable to be so diseased than the offspring of strong and healthy parents.

24. (*a.*) *Of the influence of the syphilitic taint, and of the mercurial cachexia in the parent,* in affecting the organization of the offspring so as to favour the development of external or internal scrofula, many writers are quite convinced. ALIBERT says, "that almost all the scrofulous cases at St. Louis are owing to a syphilitic infection transmitted hereditarily;" and CAMPER, STOLL, PORTAL, and HUFELAND, entertain a similar opinion. Others are of a different opinion, especially KORTUM, CULLEN, BAUMES, BAUDELOCQUE, and PHILLIPS. It is impossible to separate the influence of secondary and tertiary syphilis from that produced on the constitution by the excessive or prolonged courses of mercury, as, in former times especially, both were more or less injurious to the constitution of parents, and most frequently in connection with each other. That parents thus circumstanced may have children free from any scrofulous taint may be conceded; but that their offspring are more frequently affected with either external or internal scrofula, at the respective ages of the occurrence of these, than the children of parents who have not been similarly circumstanced, I am convinced by the frequent occurrence of these states of scrofula in children born of a parent or parents, whose constitutions, originally most sound, were deteriorated by one or both of these causes. I am aware that numerous instances will occur of the immunity of the children of parents thus circumstanced from scrofula; but many of these have not been observed or traced further than childhood, or even than the earlier years of this epoch; and of those, thus accounted exempt, or even robust or healthy at this period, many become tuberculous at more advanced ages.

25. (*b.*) *That very aged, gouty, exhausted, or debilitated parents,* have children much more predisposed to external or internal scrofula than the offspring of healthy, mature, or young parents, has been asserted by many, and denied by some. It is more generally admitted, that the children of such parents are delicate; but the opinions of many of the most observant writers of the seventeenth and eighteenth centuries confirm that of FERNELIUS, no mean observer, and justly possessed of the highest reputation in the sixteenth century, viz. "Senes et valetudinarii imbecilles filios vitiosa constitutione gignunt;" and VAN SWIETEN has illustrated the opinion with his wonted ability. In the same category parents who have exhausted themselves by *masturbation* or by *premature or excessive venereal indulgences,* may also be placed. On this subject Mr. PHILLIPS remarks: — "I do not, however, deny that children born of parents advanced in life, as well as those born of youthful parents, may present less of vigour, than the offspring of persons in the prime of health and strength, but it is not proved that they usually become scrofulous:" and he admits only that these children are often, though not always, weakly, and that a weakly child, placed under unfavourable circumstances, is more likely to suffer from scrofula than a strong one, but simply because he is weakly. It is difficult to prove the extent to which children born of parents of the description under consideration are liable to be scrofulous or tuberculous, or are more liable to become so than other weakly children; but that they are actually more or less liable to be thus affected I believe.

26. (*c.*) *Does the milk of a scrofulous nurse occasion scrofula in the child?*—Mr. PHILLIPS has ably discussed this topic, and has adduced opinions in the affirmative as well as negative. BORDEU said that scrofulous nurses communicate the disease to the child. WHITE, FAURE, LALOUETTE, and PUJOL, on the contrary, denied that a nurse could transmit scrofula to her nursling. "But the impression that the disease may be thus communicated, exists on the minds of many medical authorities in the present day." Yet in support of this opinion, Mr. PHILLIPS states, that he knows no single well-observed fact on record. I agree with him in concluding that, although there is no proof of the justness of the opinion, "that the disease may be propagated in this way, neither is it easy to procure proof that it could not happen, since such proof could only be negative; meanwhile, as all our present evidence is negative, we are justified in saying that such communication is, in the present state of our knowledge, inadmissible."

27. (*d.*) *Frequent intermarriages, or marrying in and in.*—It has been alleged by Mr. CARMICHAEL and others, that frequent and close intermarriages are generally followed by a puny race, and frequently by scrofula, in one shape or another. On this topic Mr. PHILLIPS remarks, that there is no clear evidence of the bad consequences, either on the mind or body, of frequent intermarriages. As concerns the human race, the point is not easily elucidated, and the evidence is not con-

clusive that the practice is very injurious in the lower animals. Isolated classes, as Jews, Quakers, &c., furnish no evidence in support of the opinion; but the isolation of these or other classes is not so complete as to determine the question. The closest intermarriages or connections between the sexes exist in several countries of Central Asia, as Thibet, &c.; but the inhabitants are said to be robust and healthy, the population being, however, kept down by one female in a family having several husbands, and those frequently her nearest male relations. Mr. PHILLIPS concludes, that intermarriages among healthy persons tend to no such calamity as the production of scrofula; but that he must not be understood to assert that other physical or mental influences may not result from such unions. I believe, however, that a comprehensive consideration of the subject, and with reference to the lower animals, as well as to man, will show that a close breeding in and in, when continued for more than three or four generations, will occasion a degeneration of the offspring; whilst crossings of races or breeds will give rise to increased development of constitution and power, especially in the weaker race. The Turks and Persians are manifestly indebted to the females of Georgia and Circassia for the best of their constitutional features; and few who have taken any interest in tracing the history of aristocratic families, even in this country, and are acquainted with the private histories, the intrigues, and intermarriages or crossings of many of them since the commencement of the seventeenth century, can fail of knowing how often family descent has thereby been preserved nominally, although not most legitimately.

28. (*e.*) *Does the habitual use of certain articles of food predispose the offspring to scrofula or tubercles?* — It has been supposed that pork and the viscera and blood of animals, favour the occurrence of gout in those who frequently use them as food, and often give rise to scrofula in their offspring. That these articles of diet are very often productive of diarrhœa, dysentery, and other disorders of the digestive organs, more especially in warm climates, cannot be disputed: and I believe that the offspring of those who live much on pork and bacon are more liable to scrofula, in some one or other of its forms, than persons who use a different or more wholesome diet. The food of the parents may reasonably be expected to influence the constitution of the offspring, and hence to predispose to certain diseases, in preference to others. It is difficult to determine the influences, either of an excessive use of animal food by the parent or parents, or of the restriction to vegetable diet solely, in causing scrofula in the offspring; but that either extreme may have a predisposing effect, especially when aided by other causes, may be reasonably inferred. That the vegetable diet of the Hindoos does not exempt them from the presence, if not from the prevalence, of struma, appears to be established. It is not improbable, however, that a vegetable diet in a temperate and healthy climate, when it is wholesome in kind and quite sufficient in quantity, does not, *cæteris paribus*, predispose the offspring to this distemper; whilst the excessive use of animal food, and more especially of the articles of food just noticed as often injurious, is more likely to produce a noxious effect.

29. (*f.*) *Insufficient*, as well as *unwholesome food*, certainly predisposes the offspring to scrofula, both external and internal; and when this is associated, as it too frequently is in the lower classes, with addiction to *spirituous liquors*, the injurious influence is the more marked, particularly when the mother is thus circumstanced and addicted during the periods of utero-gestation and of lactation. I have on numerous occasions remarked this to be amongst the most undoubted causes of strumous affections in the poor; but it is so generally associated with others about to be noticed, especially impure air, and insufficient ventilation, that it is impossible to say truly what degree of influence may be assigned to it solely. The numerical pathologists may, however, assign it a number; I therefore leave its true value to be calculated by them.

30. ii. CAUSES ACTING CHIEFLY DURING EARLY LIFE. — The causes of struma occurring during early life, act directly on the subjects of the distemper. These causes may be in operation during infancy solely, or during later childhood, or not until puberty, or even not until after this epoch. They are amongst the most influential causes of the distemper, especially when acting more or less in combination, as often observed respecting some of them. It is generally difficult to determine the influence of each, or even of several of them, when operating either co-etaneously or in succession, particularly when the constitution presents an hereditary taint, and, in this case, those causes are the most efficient in developing this taint into open or manifest disease. — The *milk* of the nurse, especially if she be circumstanced or addicted as just mentioned (§ 29.), or if her health be such, owing either to natural delicacy of constitution or to disease, as to render her milk insufficient, innutritious, or unhealthy, is a most influential cause of debility and disease of the infant, this disease assuming more frequently the form of internal or external scrofula, than any other. In connection with suckling of the infant, there are several causes which often concur in the production of the morbid effect; the most influential of these are the articles of food given to the infant either supplemental of the milk of the nurse, or during and after weaning, and the state of the air which the child breathes by night as well as by day.

31. *A.* The *food* and *drink* which are best adapted to the infant, before it has got several teeth, is the milk of a healthy mother or nurse; and in as far as a departure from this food takes place, so far will the development of scrofula be risked. When the mother is incapable of suckling, or her milk is unhealthy or insufficient, a healthy nurse is required; and if she cannot be obtained, then the best means of feeding the infant should be adopted. In the various circumstances in which children are brought up, it is very difficult to determine the share of injury, which may be imputed solely either to the nature and amount of their food, or to the state of the air which they breathe, or to the other influences which surround them. M. BENOISTON DE CHÂTANNEUF states, that of infants nursed by their mothers in Paris, 18 per cent. die in the first year, and that of those suckled by strangers, 29 per cent. die in the same time. Doubtless much of this mortality is to be imputed to other causes, as to the close unhealthy air of a

large city, as well as to those connected with the food of infancy. Both in towns and country districts, healthy wet-nurses cannot be obtained owing to the circumstances of the majority of those requiring them; and artificial feeding becomes their only resource. This feeding, independently of the many unfavourable influences which concur with it, fails of furnishing an appropriate nourishment; and consequently a very large proportion of the infants who are subjected to this mode of rearing, die in their first year; and of those who live, many become the subjects of internal or external scrofula. Mr. PHILLIPS has adduced a series of statistical details, illustrating the deaths during infancy of the inmates of several infant institutions, where the children are brought up by hand; and in these the deaths in the first year appear to vary from upwards of 80 to 50 per cent. In *Lyons*, a crowded manufacturing town, where the infants are suckled, the mortality in the first year was 33 per cent.; the ordinary mortality at Lyons during the first year being about 20 per cent. In the London Foundling Hospital, where the children are provided with wet-nurses, the deaths are 22 per cent. during the first five years, and of these 10 per cent. only die during the first year; but it should be recollected that a child is rarely admitted before the third month, and that it is during the first three months of life that the mortality is greatest. In large manufacturing towns and cities the number of infants reared by hand is greatest, and the deaths are also much the greatest; and the proportion of the survivors that become scrofulous is also the greatest. In London, the number of infants thus reared who die during the first year is three or four times as many as those who die from among those similarly reared in the country.

32. Whilst very much of the mortality, and of the disease of the survivors, of those reared by hand, is to be imputed to this cause, much also should be referred to the kind of food which is substituted for the milk of the mother, to the air which the infant breathes, and to the other circumstances by which it is surrounded. As respects the *kind of food* which is thus substituted, it may be stated that, in manufacturing towns, where the married women employed in the factories rear their infants by hand, little attention is paid to the nature of the food, and few of the children survive the first or second year, most of the survivors becoming scrofulous or tuberculous. Mr. PHILLIPS justly remarks, that there are two things to be noted in respect of children thus circumstanced, viz. the nature of the food and the manner of taking it. The food, even if it be milk, instead of being drawn directly from the mother, has probably been obtained some time before from a purely herbivorous animal—the cow, between the milk of which and that of human milk there is a very considerable difference, that of the former containing more than twice as much caseine, and much less butter and sugar of milk. Moreover, in towns the milk of cows is often unwholesome, especially to infants, owing to the confinement of, and modes of feeding, these animals, and not unfrequently to tubercular disease developed in them by these causes. The same author justly adds, that the mode of taking the food exercises an important influence on the health of the infant. By the act of sucking, a certain quantity of saliva is pressed into the mouth, and is mixed with the milk so as to render its digestion easier. Indeed, this is essential to good digestion in infants. Moreover, the act of sucking is an exertion which can be made only for a certain time, and hence over-distension of the stomach is prevented; whilst, when fed by hand, the risk of over-feeding is often run, by the anxiety of the nurse, and harm from this is not infrequent.

33. In the greatest number of instances, instead of milk, gruel with a little milk, sopped bread, or flour, or other farinaceous substances are used. This food is assimilated with difficulty, and readily gives rise to acidity, flatulence, and irritation of the digestive mucous surface, with all the consequent evils of insufficient secretion and excretion and impaired nutrition. Mr. PHILLIPS justly remarks, that these evils are made evident by the following facts:—"In Lancashire and the West Riding of York, the deaths in the first year of life are to the total deaths as 1 to 3·9; while in Devon and Wilts, they are 1 to 6·4! Now it is in the great factory towns, which are found in Lancashire, Cheshire, and Yorkshire, that the system of bringing up the child by hand is most commonly practised, and where its evils are most apparent; first in the great destruction of infant life, and failing that, in the development of scrofula. It is not that the mother has no milk, but that in such places she is enabled to make what she considers a more profitable use of her time, than by staying at home and nursing her child. Her infant may be suckled at early morn, and again in the evening, possibly too, at the middle of the day; but whatever food it may require at the intervening periods, if furnished at all, is afforded in the shape of the crudest and most inappropriate substances, and restlessness is known, in many places, to be habitually repressed by Godfrey's Cordial." But the mothers are not solely the guilty parties in these circumstances. The fathers are often so drunken and dissolute as to provide little or no food for their families, and the mothers are therefore obliged to be employed in the factories to provide for the wants of their children, entertaining at the same time but little desire to add to their number, or to devote much care on those which require it the most.

34. The digestion of infants is rapid, and as the quantity of food taken at a time is small, it is necessary that, during the first month, the interval of feeding should not exceed from one and a half to three hours. If, in addition to inappropriate food, the intervals between the periods of administering it be much more prolonged, as it often is in manufacturing towns, the evils must be so much the greater. Mr. PHILLIPS states, that in the larger factory towns, the deaths from tuberculous and scrofulous diseases are as 1 to 31 of the total deaths during the first year of life, whilst in the metropolis they are as 1 to 42. During the whole of life, they are 1 to 5·6 in the factory districts, and 1 to 6·4 in the metropolis. According to the experience of Friendly Societies, he adds, the expectation of life in rural districts, at 30 is 38·4 years, and in cities 32·8 years. Of the total population living at the age of ten, one half will have disappeared in cities before the age of 62, and in towns before 65; whilst in rural districts half the population will attain nearly 69 years. The greater longevity of the latter, or the

less prevalence of scrofula, is not to be imputed to the food only, even granting this be more nutritious and more appropriate, for the former may possess the greater advantages in this respect; but to the air, ventilation, exercise, &c., enjoyed by those residing in country districts.

35. Dr. BARON HOWARD gives a just but melancholy description of the character of many of the operatives in large towns.—"A large proportion of those who regularly receive high wages are constantly in a state of the greatest poverty, and often bordering on actual starvation; their houses are almost destitute of furniture, comfortless, and uncleanly; too often damp, cold, and ill-ventilated. Their families are ill-fed, scantily clothed, and badly lodged. They live much on innutritious and indigestible food, and often use articles of bad quality, or such as are rendered unwholesome by adulteration, or by being kept too long. They are extremely intemperate in their habits, and instead of purchasing wholesome food and proper clothing, the greater part of their wages is often expended by anticipation at the public house. The effect of the intoxicating liquids they consume is of course to produce a temporary excitement of the whole system, which is succeeded by a corresponding depression; they lose all relish for plain nutritious food, and their appetites can be stimulated only by something savoury and piquant. This kind of diet does not afford sufficient nourishment to repair the losses the body is continually sustaining; great languor and debility are the consequences; for the removal of which stimulants are again had recourse to, and thus an alternately excited and depressed state of the system is kept up. By this mode of life too, the digestive organs become impaired, and the function of digestion is so feebly and imperfectly performed, that even much less nutrition is extracted from the indigestible and impoverished diet they use, than would be the case if the digestive organs were in a healthy condition." This writer adds, that "scrofula in all its varied forms may be mentioned as one of the commonest diseases prevalent among the destitute poor, and which frequently originate in deficiency of food." There can be no doubt of the justness of the conclusion at which Mr. PHILLIPS arrives from his researches, namely, "that in Great Britain scrofula is least prevalent where children and others are best fed; and although I by no means assume that the immunity is entirely owing to better feeding, because where much attention is bestowed on the food, it is hardly likely that other means of maintaining health will be neglected; yet I would submit as a fair deduction from the foregoing evidence, that food exercises a more important influence than any other agent in the production of scrofula."—(*Op. cit.* p. 175.)

36. (*a.*) *What influence has particular kinds of food in causing scrofula and tubercles?*—This question has been differently, but not satisfactorily answered. Several articles of diet have been accused of producing this effect; and to certain of these I have adverted above (§ 28.). HALLER was amongst the first to mention the opinion of the prevalence of this distemper being caused by the use of potatoes. The use of these, as the staple article of food in Ireland, where scrofula is more prevalent, and the value of life is less than in England, tends to show that they may be concerned in producing these effects; but it ought not to be overlooked that they afford insufficient nourishment, and that there are other causes in operation. Mr. PHILLIPS believes that those who live almost exclusively on vegetable food in this country are less robust, and exhibit a greater tendency to scrofula, than those who subsist on an admixture of animal and vegetable food; and he considers, that our own rural population, as well as that of Scotland and Ireland, bear out the assertion. "But, although it has been shown that insufficient and improper food, however associated, may lay a foundation for that disease, we have, in truth, no conclusive proof that any particular article of food directly tends to the production of scrofula."

37. (*b.*) The *drink or beverage* used by infants and children has no mean influence in favouring the development of scrofula, and of tubercles at a more advanced age. Among the lower classes, especially in large and manufacturing towns, the frequent recourse to anodynes and carminatives, containing narcotics, sedatives, &c., in order to procure sleep or quiet for infants and young children, and to allay their wants, cravings of appetite, and irritations of temper, is of itself no mean cause of their weakness of constitution, of imperfect development of both mind and body, of scrofulous and tubercular formations, and of various other diseases, as they advance to puberty and manhood. The not infrequent practice, amongst the lowest and most abandoned classes, of giving spirituous and other intoxicating liquors to their children—of causing their infant offspring to partake of the noxious beverages in which they are themselves indulging, is productive of effects, in the innocent victims, of a similar kind to those just stated. The vices of the parent are, in the present state of society, not merely passively propagated in the offspring—to even the third and fourth generation; but are not infrequently most actively and feloniously extended, at the most tender and helpless periods of existence, to those for whom the ties of nature should be most intimate and indissoluble.

38. *B. Contaminated states of the atmosphere* are often not less influential than the nature and quantity of the food in causing scrofula and tubercles, and frequently they are the chief causes. The air may be contaminated by exhalations from drains, cesspools, sewers, and water-closets; or by stagnation or insufficient renewal; or by being respired frequently or by a number of persons or animals, without the requisite renewal; or by these several causes conjoined. In a very large proportion of the houses in manufacturing and other towns, as well as in many in country districts, the water-closets, drains, and sewers, are so imperfectly constructed as to admit of the evolution of the foul air from the exuviæ, &c. of the inhabitants, not only around, but even within their dwellings, so that they who reside in those houses are constantly breathing an air loaded with the vapours arising from the decomposition of their own excretions, which remain collected under, or close to, or even within, their apartments. These sources of contamination have been fully exposed in the article PESTILENCES—PROTECTION FROM (§ 9. *et seq.*).

39. *C.* Next in importance to this source, is the *congregation of numbers in a close or insufficiently*

ventilated place, more especially in a close sleeping apartment. Amongst the most prevalent causes of scrofula and tubercles, especially in the present state of society and manners, there are perhaps none more influential than congregating children and young persons in boarding and large schools, where they are often scantily fed, and through the greater part of the day restricted in air and exercise,—confined in a school-room, often insufficiently or improperly warmed, and imperfectly ventilated, in order to economise fuel,—subjected to premature mental exertion, or to cramming modes of instruction,—and packed into sleeping apartments insufficiently ventilated and much too small for the number confined in them. It is a common practice in boarding schools in large towns to put from six to twenty children or young persons in the same sleeping apartment; and the parents are, from ignorance, or the delusion of having a bed assigned to each, contented with the arrangement. Many such apartments even have not, during night, any ventilation, excepting what takes place by the fire-place, both the doors and windows being closed; and so foul does the air become by the morning, that it is sickening to a healthy person entering the chamber, so completely is it loaded with the emanations resulting from the insensible and sensible perspiration, and from having been repeatedly respired.

40. This *self-contamination* of the air is often only supplemental of the contaminations derived from other sources, especially from such as have been just mentioned; and which, although injurious in many private seminaries, are even still more so in many large institutions and charities, owing to the congregation of greater numbers, particularly in sleeping apartments, to ill-regulated diet-tables, to insufficient exercise in the open air, at a period of life which requires air and exercise for the healthy development of the frame, and to the over-exertion of the mind to the neglect of healthy pastimes and amusements. This cause is especially productive of the more internal forms of scrofula, and particularly of tubercles of the lungs; and is the more influential as being in continued operation during the periods of the growth and development of the frame. These congregations of young persons, especially during the age of puberty,—at the period of sexual evolution, when instinctive impulses are too strong for the controul of the weakly-exerted dictates of reason, often lead to practices which tend — and tend more than any other cause, especially at such early periods of life — to exhaust the powers of life, to impair and vitiate nutrition, and to favour the production of the several forms of the distemper now being considered. This mode of life, at this early age, as well as several others to which the lowest and even the highest, are often subjected — the one from misery and necessity, the other from ignorance, vanity, and excessive care, — is not infrequently rendered still more injurious by the want of due exposure to the sun and air.

41. *Exhalations from privies, cess-pools, drains, and sewers*, especially in large institutions, manufactories, and towns, occasion this as well as other states of constitutional disease; and to these are often added the emanations from burying-places. Amongst the poor, the influence of cold, often conjoined with humidity, and with over-crowding and insufficient ventilation; the exhalations from the soil, and from the animal and vegetable matters which are undergoing decomposition in or upon the soil; living in damp cold cellars and apartments on the ground floor, insufficiently drained and ventilated; and want of light and sunshine, are causes which aid the operation of hereditary predisposition, and of deficient or improper food.

42. Children and young persons subjected to the causes now mentioned become delicate or sickly. The vital endowment and the structural development of the several organs and textures are impaired or arrested in their progress. Like plants growing excluded from sun and wind, their vessels often extend rapidly in the direction of their axis; but the parietes of the vessels and their lateral branches are thinly or weakly formed, are surrounded by a lax cellular tissue or parenchyma, and both the organic nerves and the animal fibres are imperfectly constituted. The formative processes seem arrested before they are completed. The circulating fluids present a superabundance of the serous and albuminous constituents, and a deficiency of fibrine and of red-globules. Whilst the blood is defective in its crasis, the blood-vessels are impaired in their tone; and the veinous and lymphatic systems are more manifestly or more prominently developed. This condition of the frame often proceeds, as shown above, from the parent or parents. In many cases it is acquired in early life from various causes, especially from those now mentioned, as insufficient or improper food, breathing an impure or self-contaminated air, a cold and humid atmosphere, or dark, cold and damp apartments, cellars, &c., the crowding of numbers in ill-ventilated places, and particularly in sleeping apartments, premature sexual indulgences, and solitary vices which waste or exhaust nervous and vital power, and consequently impair the digestive and nutritive processes, at the periods of life when due assimilation and nutrition are most required; and, whilst these causes often generate this state of frame, they produce, in various parts, textures, and organs, but particularly in the lungs, the deposit of tubercular matter.

43. There are other causes or circumstances influencing the constitution of young persons which have been viewed by some, and denied by others, to be concerned in the production of scrofula. But much of the difference of opinion on these topics depends upon the limitation of the term scrofula, or the extension of it, to the senses already stated (§ 4. *et seq.*). That confinement in prisons, in poor-houses, in asylums, in charitable institutions for education or reformation, in factories, &c., will occasion some form or other of scrofula, more especially tubercular deposits in internal organs, cannot be gainsayed with truth, although this morbid effect may be manifested in so few as to almost justify the denial of its existence, especially where a sufficiency of wholesome food, exercise in the open air, due light, ventilation, and sunshine are enjoyed. But where these are more or less wanting, and especially where there are over-crowding, particularly in sleeping chambers; low ranges of temperature, conjoined with dampness; contaminated states of the air; depression of spirits or anxiety of mind, &c., the morbid effects will soon become manifest, and

frequently in the forms constituting those now under consideration. Most of the causes already considered have been numerically and statistically investigated by Mr. PHILLIPS, who has thrown much light upon several of them; but, in the extended sense in which I have viewed the subject, — not solely with reference to external scrofula, nor to childhood, but with regard to both the external and internal distemper, as observed at all periods of life,—I believe that several causes, which he views as possessed of little or no influence, are actually deserving of more consideration and elucidation than they have hitherto received. There can be no doubt that, in the several circumstances just enumerated, and in the different classes, positions, and employments of life, certain causes are more influential in some of these than in others — in one class or occupation than in the rest; and that, where several causes are in simultaneous action, it is difficult to estimate the relative value of each; but, nevertheless, whatever cause has the effect of lowering the powers of life, of impairing assimilation, nutrition, and strength, will, in a considerable proportion of those thus affected, give rise to tuberculous deposits, particularly if an hereditary predisposition or constitution already exists, and will reinforce or determine the action of other agents in developing this mischief.

44. *D. May scrofula and tubercles be communicated by contact or inoculation?* — (*a.*) ARETÆUS believed in the communicability of scrofula, and considered it dangerous to live in the same room with scrofulous persons. BAUMES, CHAUMETON, and others, have entertained the belief of the transmission of the disease to infants suckled by scrofulous nurses. BORDEU, no mean authority, states that young healthy women have married scrofulous men, and have become so themselves. BAUDELOCQUE, however, remarks that, in the "Hôpital des Enfans" there are 150 beds occupied by scrofulous patients, but that he has never observed any thing that occasioned a suspicion of contagion. Mr. PHILLIPS says that he never heard of a single instance of the communication of the disease by contagion in the several institutions which he has visited. PINEL and RICHERAND have furnished a similar testimony.

45. (*b.*) *Inoculation* of scrofulous matter was practised by HÉBREARD on dogs, but no sign of scrofulous infection was observed. LEPELLETIER tried similar experiments without effect; and Mr. PHILLIPS states that LEPELLETIER, GOODLAD, and KORTUM applied scrofulous pus to the wounds made for vaccination, and also to wounds made without reference to vaccination, but that scrofula was not produced, although the vaccination succeeded when the vaccine lymph was introduced with the scrofulous pus. Such experiments are most unwarrantable, and even criminal.

46. There may be but little risk of infection from cases of scrofula, when the disease is seated externally. But I believe that there is some reason for believing tubercular disease of the lungs, in the second and third stages, by no means devoid of risk to healthy persons, who may frequently inhale the breath of persons in either of these stages of the malady, or may sleep in the same bed, or even live in the same room, if small or ill-ventilated, with persons thus diseased. It should not be permitted for a sickly or scrofulous child, or even for any one with pulmonary tubercles or with open scrofulous sores, to sleep in the same bed with a healthy child or person, however confidently several writers may assert the non-communicability of this distemper; for, although this may be true in ordinary circumstances, those which I have just mentioned may favour the occurrence of very different effects.

47. (*c.*) *May pus from a scrofulous person, although not derived from a scrofulous ulcer, communicate the malady?*—It has been supposed that leucorrhœa in scrofulous females, and that vaccination, or variolous inoculation, from a scrofulous child, will communicate scrofula to persons of a sound constitution. Several writers have favoured the affirmative of this question, but their facts are false, and their reasoning inconclusive. Mr. PHILLIPS remarks that "an important question is raised by RILLIET and BARTHEZ with reference to the influence of small-pox and scrofula. We have seen that DE HAEN and ROWLEY were of opinion that the inoculation of small-pox had a tendency to excite in the system the development of scrofula; while RILLIET and BARTHEZ state, that in any of the variolous cases they have observed, the eruptive fever has not been terminated by tuberculisation. They believe it to be proved that small-pox and tubercular disease are of different natures and mutually repel each other; that since the use of vaccination tubercular diseases had become more frequent; that those children who die without having had small-pox are more frequently tubercular than otherwise; and that of those vaccinated a greater number are disposed to tubercles than of those who have not been vaccinated. They, however, guard themselves from assigning vaccination as a cause of tubercles; all they have been able to observe is, that a greater number of vaccinated children die with than without tubercles. The only precise evidence they furnish for the opinion is the following: — Of 208 vaccinated children, 138 died tubercular, 70 non-tubercular. Of 95 children who died without having been vaccinated, 30 were tubercular, 65 not so." — (p. 149.)

48. These results certainly agree with my own observations, and confirm an opinion I have long entertained respecting the comparative effects of vaccination and small-pox upon the prevalence of scrofula. That scrofulous and tubercular matter may become partially resolved and absorbed, the cretaceous or mineral parts of the deposit only remaining, has been proved to take place, but the exact circumstances in which it does take place have been very insufficiently ascertained. RILLIET and BARTHEZ believe that small-pox more especially, scarlatina and typhoid fever, tend to favour this resolution. That scrofulous and tubercular affections have increased since the introduction of vaccination is undoubted; and that the dangers from the inoculation of small-pox, under due management and care in preventing the occurrence of the non-inoculated disease, were actually few, although remarkably exaggerated, are also certain; so that balancing the results from the introduction of the one, and from the suppression of the other, it is very difficult to say, that humanity or society has gained any thing by these measures.

49. *E. May other diseases occasion scrofula and tubercles?* — As already shown, it cannot be doubted that vaccination favours the prevalence of the several forms of scrofula; but it is not evident

how this result is produced. Can it be occasioned by the inoculation of a virus, which, although productive of a local effect, causes a certain taint of the constitution, which is not prevented, or removed, by its elimination in the form of pustules on the external surface? According to this view, vaccination may be, in many instances, the introduction of a poison or virus, which slowly and silently contaminates the frame, without being maturated and thrown out on the surface; whilst small-pox has a very different effect, owing to the free suppuration of the pustules and the elimination thereby of the morbid material or virus from the system. Besides vaccination, inflammations, measles, hooping-cough, &c. have been supposed to favour the production of scrofula; but there is not sufficient evidence to prove this occurrence, further than that all diseases which lower vital power and resistance will more or less aid the operation of the more efficient causes of this distemper. Notwithstanding the laudation bestowed upon vaccination, I believe that, as the lapse of time allows the fact to be more fully demonstrated, it will be found to be a not unfruitful source of scrofula and tubercles; and that its effects will be imputed to the circumstance just mentioned.

50. *F. Climate, residence in large towns, occupations in factories, confinement in union-houses, in pauper institutions, in prisons, &c.*, and other circumstances tending to prevent due exercise in the open air, or sufficient ventilation, or to deprive persons in early life of the requisites to healthy assimilation and nutrition, may be considered as concurring agencies in the production of either external or internal scrofula. Mr. PHILLIPS has investigated these analytically, but with reference only to the production of external scrofula, and has come to the conclusion that "the development of scrofula is not shown to be so influenced by climate or temperature as to bear any definite relation to the warmth or coldness of the country in which the disease is found. Neither the general mortality, nor the deaths from scrofulous diseases, bear any definite relation to the closeness with which the population is crowded together, whether the comparison is made between one town or district and another, or between different portions of the same town or district. Particular occupations and social conditions exercise a greater influence on health and the duration of life, than is produced by impure air or insufficient ventilation, but they do not operate in the production of scrofula in the sense of a specific agent, or of a direct cause. The general mortality and the deaths from particular diseases, bear a close relation to the poverty of the population, and to the vicissitudes, or alterations of prosperity or adversity, to which they may be exposed; whilst wealth and station, which insure to the more elevated classes of the community abundant food, ample clothing, convenient and well ventilated dwellings, and pure air, are nevertheless unfavourable to longevity; and the industrious labourer, whose toil insures steady remuneration, and whose temperate habits and provident character insure him the necessaries of life, good of their kind and ample in quantity, is in the condition the most favourable to long life and uninterrupted health. In the last result, then, it is to diseased nutrition, however brought about, that we refer the production of scrofula; an opinion in which there may be some novelty, inasmuch as many authors have assigned to perverted nutrition a powerful agency in developing the disease — especially CARMICHAEL in England, and LEPELLETIER and BAUDELOCQUE in France; yet my controversy with BAUDELOCQUE consists in a denial of the exclusive agency which he assigns to impure air in deranging nutrition." (p. 239.)

51. Whilst the disease is imputed chiefly by Mr. PHILLIPS to insufficient food, the other circumstances, which I have viewed as concurring causes of no mean influence, especially a self-polluted or otherwise contaminated air (§§ 38–42.) are considered of little importance by him, provided that the food is sufficient. It is manifest, however, that his investigation of external scrofula, chiefly with reference to an early age, has led him to overlook the more remote influences of certain causes, which he accounts of little importance. "But the cause of diseased nutrition," he remarks, "at that period of life when the seeds of scrofula are sown, is, in the vast majority of cases, insufficient food or improper feeding; and even if the less direct agencies, which we have been considering, occasioned scrofula much more frequently than we believe they do, the distinction is of great practical importance,— viz. that they do not act in virtue of a specific influence suited of itself to produce scrofula, but as general morbific agencies which impair digestion, and thus indirectly contribute to the production of the disease. That food, insufficient in quantity, or innutritious in quality, stands in the relation of cause to the development of scrofula, more directly than any other morbific agent, is shown by this circumstance, that whenever food is abundant in quantity, and of a sufficiently generous character, scrofula is kept under, that is to say, it is less frequently seen, although other noxious agents are, perhaps, rife, and the general mortality is great; and that in our rural districts, where the air is probably pure and the occupation healthy, and where the general mortality is small, scrofula is largely developed; because the food, even when abundant, does not contain sufficient stimulus to preserve the frame in healthy vigour. Yet, although we may have no satisfactory proof that a contaminated atmosphere, or any one of the other indirect agencies to which we have referred, will operate so injuriously on the digestive functions as of itself to induce scrofula, I do not the less deplore the influence of those debilitating agencies, which impair the healthy activity, and lessen the proper vigour, of large numbers of our countrymen." (p. 241.) But that the injurious or indirect agencies which Mr. PHILLIPS considers so little influential, are really of importance as respects the development of external and internal scrofula, both in early life and in more advanced age, I am convinced, although a sufficiency of wholesome food will counteract them to a considerable extent, and especially when an hereditary taint or predisposition is not present.

52. The injurious influence of insufficient feeding in poor-houses, union-houses, in other pauper institutions, and in prisons, has been sufficiently demonstrated by CARMICHAEL, BALY, PHILLIPS, TYLER SMITH, and others. But it is not to the insufficiency of food alone that the production of scrofula should be imputed, although it may be admitted to be the chief agent. Crowding of the sleeping apartments, breathing an impure or con-

taminated atmosphere, insufficient ventilation, confinement or deprivation of exercise in the open air, and depression of spirits, co-operate more or less with this more efficient cause. But, as in most of the union-houses, the inmates have more food than the independent labourer can procure, even when fully employed, it cannot be a matter of surprise to find scrofula more prevalent in some country districts than it is even in some manufacturing towns. In connection with this subject Mr. PHILLIPS very justly remarks, that, believing the health of the child, and the vigour of the man, to depend upon the sufficiency and nutritious character of their food, a still more liberal diet for pauper children than is at present afforded would, at one and the same time, better the health of our population, and be consistent with a sound national œconomy. The reports of the Inspectors of Prisons furnish numerous instances where prisoners have manifested glandular tumours under the discipline to which they have been subjected, and have quickly rallied under an improved diet. Dr. BALY states, that a "marked difference in respect of their general health and the number affected with scrofulous disease is presented by the convicts sent to the central prison at Milbank, from different parts of Great Britain, preparatory to their transportation. By far the thinnest convicts, and the largest proportion of unhealthy and scrofulous individuals come from the Scotch prisons, in which the diet consists of a sparing allowance of vegetable and farinaceous food."

53. iii. OTHER CAUSES CONCURRING IN THE PRODUCTION OF THE SCROFULOUS TAINT, AND AIDING OR DETERMINING THE DEVELOPMENT OF TUBERCULAR FORMATIONS.—*The Causes* which have been here insisted upon are certainly the most influential in the production of latent and developed scrofula and tubercles; *but there are others*, which concur with the foregoing either in producing a scrofulous taint, or external scrofula merely, or in developing internal tubercles, especially in the lungs, in persons who are already imbued with this taint, and which, when acting energetically, may produce this effect even on those who are not manifestly thus imbued. In this latter case, the causes in question, acting either independently of the foregoing causes, or conjointly with them, or aiding and determining their effects, impair not only the vital energy and vital functions throughout the frame, but also the nutrition of the several tissues, and the intimate condition of vital cohesion and action. Many young persons, possessed of a scrofulous diathesis, or who have been the subjects of external strumous disease in childhood, and even some who present no very marked sign of a scrofulous taint, become, as puberty, or early manhood, or more mature age, is arrived at, the victims of tubercular formations in some internal organ, especially in the lungs, owing to the operation of those causes, which I am now about briefly to consider.

54. *A. Neglect of Exercise in the open Air* — of exposure to the light of day and to sunshine — is one of the causes which is most influential in superinducing tubercular formations in the scrofulous diathesis, and even in constitutions which evince no evidence of this taint. The general neglect of the indications suggested by the alternations of night and day — the neglect of repose during the hours of darkness, and of rising and of being employed during the hours of day — the common practice of pursuing our avocations and recreations during a large portion of the time intended by nature for our repose, and of devoting a large portion of the day to sleep, is not without influence in impairing the constitutional powers, in weakening the assimilating and excreting functions, and in relaxing the mental vigour. An early departure to nocturnal repose, and the limitation of this repose to the hours of darkness — the trite maxim of "early to bed and early to rise," &c., is of much greater importance than is indicated by the practice of modern times.

55. *B.* Inattention to a *due preservation of the cutaneous function* is not without its influence. The imperfect performance of this function, the sudden arrest of it, or the entire suppression of it, however well it may be vicariously discharged by the lungs, kidneys, or intestinal canal, endangers the healthy condition of the blood, and disorders the assimilating processes. It should not be overlooked, in our pathological speculations, that the cutaneous function is supplemental of other important functions — of the respiratory, of the renal, of the hepatic and of the intestinal, — and that, even when no supplemental or vicarious office may be traced to this function or to either of these other functions, a very intimate relation subsists between them, the due discharge of the one influencing the others more or less. The importance, therefore, of duly regulating this function, guarding against its excess as well as its suppression, by proper clothing and exercise, will be admitted.

56. Among the *dark-skinned races*, a free and even an abundant cutaneous perspiration is most necessary to the continuance of health; and when it is habitually diminished, especially by migrating to a colder climate, tubercles, especially in the lungs, supervene in very numerous instances. A diminution of the accustomed perspiration may not, however, be the sole cause of this liability of the Negro and other dark races to tubercles after migrating to temperate or cold climates. The sedative influence of cold upon the constitution of these races may have a considerable or chief share in the production of this effect, especially in connexion with the obvious want of adaptation of the constitution of these races to temperate and cold climates. Of the *influence of Climate* generally upon the prevalence of scrofulous and tubercular diseases no precise data exist. The subject, however, will be adverted to in the sequel, and in the article on Tubercular Consumption.

57. *C.* Intimately connected with the foregoing is *the influence of Dress and of various Physical Conditions depending on Occupations and Habits of Life.* Exposure of parts of the frame requiring protection or uniformity of temperature, as the upper regions of the chest, and the hips and lower extremities, to vicissitudes of season and weather, and sleeping in too low a range of temperature, are injurious, the effects being more frequently manifested in the lungs than in any other organ. To restrain habitually the movements of the thoracic and abdominal parietes, by position, by occupation, or by dress, or to otherwise embarrass the function of respiration, is much more injurious than is generally considered. The stooping position, particularly when long continued, or frequent; stooping at a low desk or table, especially if a part of the parietes of the chest is brought in contact with, or rests upon,

the desk; and, above all, stiff and closely-laced stays or corsets, are amongst the most injurious agents to which youth or mature age can be subjected, and their effects are most frequently manifested by favouring the development of tubercles.

58. Stiff or unyielding stays prevent the due exercise of the muscles of the trunk, impair their development in early life, and weaken these muscles at later periods. If this article of dress be too closely applied or drawn around the waist, the movements of the ribs are restrained or even prevented; the liver is carried upwards, and it invades the thoracic cavity, compressing the lungs and embarrassing the circulation through the heart and large vessels; and the colon is more or less displaced, or pressed upon, with the rest of the abdominal viscera. The undoubted consequences of these conditions—consequences, which vary in amount and danger with the cause now assigned—are an imperfect performance of the respiratory, of the digestive, of the assimilating, and of the excreting functions; and ultimately a morbid state of the blood, tubercular depositions, especially in the lungs, hæmoptysis, anæmia, &c.

59. Not less injurious than tight lacing is the practice of wearing unyielding supports in the stays, especially steel supports, which, however well covered, tend to carry the electro-motive influence from the frame, and to withdraw a salutary stimulus of nervous power from the system. The importance of attention to this matter is not hypothetical but real, as proved by long and frequent observation, and by the results following the removal of this evil. The more freely the movements of the trunk and spine are allowed to be performed, and the more efficiently the actions of the muscles concerned in these movements are accomplished, the more certainly and healthily will the functions of the several organs contained in the trunk be discharged. (See art. Disease, § 23. *et seq.*)

60. *D. Excessive secretion*, and more especially an excess of the recrementitious secretions, or an undue discharge of the latter contrary to the intentions and indications of nature, and particularly the unnatural and debasing vice of manustupration—a vice most generally practised by prudes, the unmarried, and the sanctimonious—have no mean influence in the production of tuberculosis, especially of the lungs, even independently of the pre-existence of a scrofulous diathesis. The vice now adverted to, and a premature or excessive sexual intercourse, are injurious both by the discharge from the œconomy of a secretion intended to aid the healthy development of the frame, and afterwards to support and to promote the nervous and other functions, and by the frequent and excessive excitement, by which this discharge is preceded, a consequent state of languor, depression, and vital exhaustion always resulting.

61. *E. Prolonged mental application*, or exertion, is more or less exhausting to both mind and body, as respects not only its direct operation, but also its indirect influence, especially in preventing a salutary recourse to hygeienic measures, and inducing a neglect of exercise in the open air, of change of air, and of the various recreations which tend no less to strengthen the body than to invigorate the mind.

62. *F. An inordinate indulgence of the passions* and affections; the various depressing moral emotions, anxiety of mind, hope deferred; frettings and disappointments, losses of fortune and friends, and all the sentiments which tend to weaken the organic nervous energy and lower the heart's action, more or less affect the digestive and assimilating as well as the excreting functions, lower the powers of life, vitiate the circulating fluids, impair or alter the nutrition of the structures, and thereby favour or develope tubercular formations. But it is unnecessary to pursue this topic any farther, as it is more fully considered in another part of this work (see art. Disease, *the Causation of*, § 22. *et seq.*).

63. III. Of the Pathology of Scrofula and Tuberculosis. — Writers on scrofula and tubercular deposits have differed remarkably not only in respect of the identity of these morbid states, but also as regards the origin, modifications, complications, and various other pathological relations of both. It will, therefore, be requisite to describe — 1st, *The Structure of Scrofulous and Tubercular Matter* — *a.* as anatomically displayed, — *b.* as appearing under the microscope, — and *c.* as determined by chemical examination; 2nd. To enquire into *The Identity and Dissimilarity of Scrofula and Tubercles*; — 3d. To consider *The Pathological Relations, Origin, and Nature of these Maladies*; — 4th. *Their Localization or Seats*; — 5th. *Their Modifications and Complications*; — 6th. *The Comparative Pathology of Scrofula and Tuberculosis.* — The discussion of these topics will prove the best introduction and guide to the consideration of the very important subjects of the *prevention* and *cure* of these very prevailing diseases.

64. i. The Structure of Scrofulous and Tubercular Matter. — Scrofulous and tubercular matters are peculiar morbid formations, the product of an altered secretion and nutrition of the parts containing them, arising independently of inflammation, although frequently associated with a modified state of inflammatory action, apparently induced by these morbid products. These morbid formations are different, — 1st, from the products of ordinary inflammation, occurring in a previously healthy constitution; — 2nd. from other morbid growths, as shown in the article on Scirrhous and other Morbid Tumours. The scrofulous change, matter, or deposit, present various appearances, superficially, according to its stage, its seat, and the alteration of the surrounding tissues; yet it is essentially the same, at each of its stages, whether it is formed in a scrofulous external gland, or in an internal organ. It varies chiefly in grade or stage, or in the successive changes which it undergoes, and in the form of its infiltration, especially at an early stage. Opinions, however, on these and other allied topics are extremely various, but I shall notice the chief of them.

65. *A. The Physical or Anatomical Structure of Scrofulous and Tubercular Matter.* — (*a.*) As respects *scrofulous* or *enlarged superficial lymphatic glands*, the difficulty has been to demonstrate the changes which take place at the commencement, or at an early period of this disease. The question to be solved respecting them is whether the tubercular deposit, which is undoubtedly the chief change even in them, is the primary mani-

fest lesion, or whether the increased vascularity often attending this deposit, is the primary morbid alteration? This question will, however, be more fully considered in the sequel, but before it can be entertained, the appearances presented by the scrofulous deposit, in various situations and seats, require to be noticed. The most obvious change in a scrofulous gland is its increased size. LLOYD and SOEMMERING ascribe this enlargement chiefly to thickening and increased vascularity; but it is more certainly owing to tubercular infiltration, in patches and rings, throughout the structure of the gland. The gland often remains in a stationary condition for a long time, presenting a granular yellow tuberculization, with little or no increase of vascularity, and with a permeable state of the vessels. But as the morbid deposits augment, the vascularity of the gland itself diminishes, or is gradually obliterated, owing to the pressure of the infiltrated matter, although the vascularity of the cellular tissue surrounding the gland is increased. BREDOW considers that the vessels found early in scrofulous glands belong to the tissue of the gland itself, and not to the scrofulous deposit in it.

66. Tuberculous matter, then, is infiltrated in the tissues of a gland, organ, or part. Sometimes traces of those tissues may still be recognised in the tubercular mass. It is only in such cases that any appearance of blood-vessels can be traced, the vessels being merely those belonging to the infiltrated tissues. In other cases, the tissues, being more and more compressed by the increase of the tubercular matter, almost or altogether cease to be distinguishable, and nothing is to be found but a homogeneous mass of this matter. In some instances, the mass is isolated by degrees from the surrounding living parts, and a cyst becomes formed around it, as is formed around pus or any foreign body. Here there is a close analogy between the formation of pus and tubercular matter, either of which being infiltrated into the tissues of the part in which they are found, and afterwards becoming isolated by impacting the tissues around them into a cyst. According to MECKEL (*Pathol. Anatomie*, 2ter Bd., 2ter Th., s. 370.), the encysted state of tubercles is more frequently met with in the lower animals than in man.

67. KINGSTON, THOMPSON, and LUGOL, however, maintain that they have recognised blood-vessels in tubercles; but CANSTATT remarks that SEBASTIAN explains this rightly in viewing it as a mistake, arising from the circumstance of tubercular matter being sometimes deposited on a small blood-vessel without giving off a branch to this deposit. ANDRAL, ROCHOUX, CARSWELL, CANSTATT, and others agree in asserting that lymph-vessels do not communicate with the scrofulous deposit.

68. MM. BARTHEZ and RILLIET infer—1stly, that, when a *lung* contains grey granulations isolated from one another, an injection penetrates easily by the bronchi and by the pulmonary arteries and veins;—2nd. That the vascular network which surrounds the granulations communicates very evidently with the pulmonary artery, and probably not with the vein; — 3rd. That the bronchial injection surrounds on all sides the grey granulation, and conceals it in part only: it is not disposed in very fine ramifications similar to a vascular lacework, but in little grains united to one another; and 4th, That perhaps the bronchial injection can penetrate the granulations. As respects the semitransparent, grey infiltration, they state that there the veins and pulmonary arteries are very penetrable by injections, whilst the small bronchi are obliterated, which latter fact is similar to what is observed in pneumonia. These observations, however, do not prove the vascularity of tubercular deposits, but rather that this deposit, as respects the lungs, often takes place in the vesicular structure or air-cells of the organ, as supposed by MAGENDIE, CRUVEILHIER, CARSWELL, ANDRAL and KINGSTON. That the vessels become obliterated with the progress of tubercular infiltration is contended for by GUILLOT and CANSTATT, according to whom the tubercle itself is always non-vascular, but around the mass, or around the cavity left by it, an infiltrated layer of grey matter exists, which obliterates the vessels in the space that it occupies.

69. Dr. GLOVER remarks on this topic, that these facts and observations, taken together, lead to the conclusion of the vascularity of tubercle being a non-essential phenomenon; and that the obliteration of the vessels of the tissue into which the scrofulous or tubercular matter is effused may be carried to a greater or less extent. And it further agrees with my own observations, that the irritation produced by the infiltrated matter in the surrounding tissues may cause either increased vascularity, or in some instances obstruction of the vessels,—and that the enveloping tissue of the tubercular mass may thus be either more or less vascular or devoid of vessels; but that tubercular matter is itself non-vascular.

70. The tubercular deposit, whatever may be its seat, may be viewed as a small tumour, or tubercle, varying remarkably in size, from that of a small pin's head to that of an orange; and in colour from a greyish, semi-translucent hue to a yellowish white or greyish yellow, commonly of a round form, at first firm but friable, afterwards being transformed into an heterogeneous matter consisting of whitish, curdy masses and a sero-puriform fluid. When the tubercle is changed to this state, it generally gives rise to an ulcerous cavity, which extends more or less rapidly in every direction, sometimes remains stationary for an indefinite period, and, in much rarer cases, becomes cicatrized, or covered by a sero-fibrous lining.

71. (*b.*) Much discussion has arisen as to *the earliest recognised form and appearance* of the tubercular formation. M. LAENNEC conceived, that the white opaque corpuscle, constituting tubercle, is preceded by a greyish, semi-transparent granule, in whose centre is developed a whitish point, which by degrees extends to the surface, and involves the whole substance of the granule; so that the granule is really the first stage of tubercle. Dr. BARON and M. DUPUY believed that tubercles originate in a transparent vesicle. M. ANDRAL has endeavoured to ascertain the accuracy of this opinion: and he states that it is quite certain that, in some few cases, small, round, transparent vesicles, filled with a serous fluid, are found along with undoubtedly genuine tubercles of various sizes in the lungs of the horse; but that he has never been able to find this appearance in the human subject, excepting in one solitary case. He has sometimes seen the fluid, contained in these vesicles in the horse, lose its transparency and become turbid; and the entire vesicle thus assume

the aspect of the opaque, white tubercles around it. From this M. ANDRAL infers that the transparent vesicles found in rare cases among tubercles are only accidental productions, with which the latter are complicated; that they cannot be considered as the early stage of tubercles; and that, although they occasionally seem to secrete a matter similar to that observed in the early stages of tubercles, yet this does not prove identity.

72. M. ANDRAL further contends that the original form of tubercle is not a serous vesicle, nor a greyish semi-transparent granule, as LAENNEC maintained. The opinion of this latter pathologist respecting the origin of tubercles in granulations has led to the notion, that the small, greyish, irregularly rounded bodies sometimes found studding the free surface of serous membranes, are incipient tubercles. M. ANDRAL, however, more correctly views them as the mere rudiments of false membranes; and a similar mistake has been made in considering as incipient tubercles, those greyish granules sometimes found in mucous surfaces, which seem to be merely mucous follicles in a state of enlargement. The identity, therefore, of the granulations found in different organs and surfaces with tubercles is not proved, although those granulations are frequently complicated with tubercles, and may secrete tuberculous matter as they may secrete pus.

73. M. CRUVEILHIER has advanced another opinion, namely, that before the occurrence of tubercle as a hard body, and at an earlier period, it may be detected in a fluid puriform state. MM. TROUSSEAU and LEBLANC have, as well as CRUVEILHIER, found among well formed tubercles clusters of points, in some of which was a purulent infiltration, in others very small abscess. M. ANDRAL has seen, in a few cases, a similar appearance; but although those facts seem to offer some confirmation to M. CRUVEILHIER's opinion, yet the same objection applies to it as I have already adduced. It is probable that tubercles are secreted in the fluid state, but the fact is not demonstrated; and, however small tubercles may be, they are always found in the solid state. I have observed these bodies in the lungs of very young infants, and of the fœtus at the full time — where they are extremely rare — but they have always presented the solid or consistent form.

74. It may be granted, as contended by M. ANDRAL, that tubercles are in their first stage when they appear as minute, opaque, friable, rounded bodies of a yellowish-white colour, and without any trace of organisation or texture. But this is not the only form in which they may commence. Besides these *yellowish miliary tubercles*, there is another form, which, since the appearance of the writings of BAYLE, has been the subject of much discussion, namely, *the grey, semi-transparent granulations*, which, according to LAENNEC and LOUIS, are the first degree of development of tubercle, the miliary yellowish tubercle being only a transformation of the greyish granulation. This is, in fact, confirmed by microscopic observation by LEBERT. (§ 85.) The grey granulations, transparent towards their margins, and sometimes also at their centres, often show in this latter situation a point more opaque and yellower than the rest. They are not surrounded by any envelope. They do not constitute the necessary and constant origins of fully developed tubercles, but are only one of *two forms which these bodies assume at their commencement*, the yellowish miliary tubercle often commencing as such, and sometimes being a transformation of the greyish granulations. Tubercle may, therefore, at its commencement present either of these forms; or it may appear as a grey and yellow infiltration, as a gelatiniform infiltration, or as tuberculous dust, according to French pathologists. It was supposed that the grey granulations occurred only in the lungs; but it has been shown by MM. VALLEIX, PAPAVOINE, NELATON, and others, that they are found also in other organs.

75. In scrofulous meningitis grey granulations and yellow particles are observed as in the lungs. The former may also be detected in the glands, especially in the mesenteric glands, and between the coats of the intestinal canal. BARTHEZ and RILLIET also view the grey granulation as a form of incipient tubercle, not peculiar to the lungs, but existing occasionally in other organs, as under serous membranes, in the spleen, kidneys, liver, lymphatic glands, &c. It is chiefly developed in the cellular tissue, especially that connecting serous or other membranes to adjoining parts, and is often produced by congestion or by a mechanical hyperæmia. It is not improbable that the grey and gelatiniform infiltrations of LAENNEC are early stages of tubercular formations. The gelatiniform infiltration may pass into a grey infiltration, and this latter into a grey granulation, which may or may not go on to the state of yellow tubercle. The tubercle-grains, whether yellow, miliary, or semi-transparent granulations, are most separated and scattered when small, or at an early stage of development. As they increase in size, they often become confluent. In the lungs more especially, they present every grade or stage both of change and development: — There are often found, even in the same subject, the grey or semi-transparent granulation, rarely alone, but usually accompanied with yellowish granulations; the small miliary tubercle, quite yellow and caseous; tubercles much larger; masses more or less softened, or even cretaceous cavities, &c. In many cases death supervenes before a large proportion of the minute greyish tubercles, or granulations, has reached more advanced phases of their growth or progress. In many instances, greyish granulations are found as the commencement of tubercular disease in one organ, and the yellowish miliary tubercle in another organ or part. It is not rare to find in young children the latter in the sub-arachnoid cellular tissue, and the former under the pia mater. Grey granulations are often found in the sub-pleural cellular tissue, and yellowish tubercles in the lungs.

76. (*c.*) *Grey granulations* are ound to possess the globules of tubercle from their earliest appearance (see the microscopic appearance of tubercles, § 81.), and may exist in every part in which tubercle has been detected. — *b.* They are not a product of inflammation, although they may be found in inflamed structures. — *c.* They are most abundant and most frequent in the lungs and in the pia mater. — *d.* They are sometimes accompanied in the lungs with a dark or melanotic secretion. — *e.* When death does not take place early, they generally pass into the form of *yellowish tubercles*, by the destruction of the fibriles which separated their constituent elements and by the

progressive deposit of the tubercular matter. — *f.* *Tubercles* do not necessarily commence in the greyish semi-transparent granulations, but also as frequently commence as yellow and opaque miliary tubercles. — *g.* In the same body both these forms of commencing tubercle are not unfrequently found, not only in different organs, but even in the same organ.

77. (*d.*) *Growth.* — Besides the transformation already stated (§ 70.), and previously to it, tubercles experience an *increase of bulk.* It seems important to ascertain how a body of the size of a small pin's head may acquire the bulk of a small orange. To account for this remarkable development, it has been supposed that this morbid production has the power of living like organised beings — of growing by intus-susception. But if this were the case, it would show appearances of organisation and vascularity: now, however large the tubercular mass may be, no trace of either the one or the other can be detected in it. We can, therefore, view this formation merely as a morbid secretion, which, having once commenced, continues; the deposition of the particles of tuberculous matter separated by the vessels from the blood increasing the mass.

78. (*e.*) The *softening* of tubercles, or the puriform transformation of them, seems to arise from the circumstance of their acting as foreign substances on the surrounding tissues, the tubercular matter exciting a secretion of sero-puriform fluid from those tissues. This fluid divides mechanically the tubercle, and changes it into the state usually termed that of softening. The tubercular matter being once secreted in the tissue of an organ or part, thus becomes, after a time, a source of irritation to the vessels of the tissue in contact with it; and the consequence of this is the effusion of a fluid secretion which breaks down the tubercular matter. The semifluid matter thus formed tends to perpetuate and to increase the irritation of the surrounding tissue, and necessarily leads to a solution of continuity by which a way is opened for the escape of the tubercular matter, as in the case of a foreign body. But even after this has been accomplished, the morbid process excited in the surrounding texture generally continues. This theory of the softening of tubercles does not differ materially from that adopted by MM. LOMBARD and ANDRAL. After the expulsion of the tubercle has been accomplished, the process of suppuration may continue, and, moreover, the same cause which had produced the tubercle before, may produce it again; the same process which eliminated it may contribute to the renewal of its formation: so that, far different in this respect from a foreign body introduced from without, the tubercle may be indefinitely recreated simultaneously with the pus destined to produce its discharge. It has been asserted by ROKITANSLY, MR. RAINEY and several pathologists, that the softening of tubercles always commences at their centres: this is certainly the case in many cases; but the process may also begin in other parts, and particularly towards their surface. When it commences in the centre, it may be imputed to a decomposition taking place in those molecules of the mass first deposited and furthest removed from the surrounding living tissues.

79. (*f.*) In rarer instances tubercles, in place of being softened, acquire unusual hardness, and are *transformed* into a firm gritty mass, in which a considerable quantity of the phosphate and carbonate of lime is found upon chemical analysis. These salts likewise exist in the softened, as well as in the early stage of tubercles, but in much smaller quantity. The transformation of the tubercles into a harder substance seems to proceed from an absorption of a considerable portion of the animal matter of which they chiefly consist. M. THENARD found tubercles, in their primary or unsoftened state, to consist, in 100 parts, of 98·15 of animal matter, of 1·85 of the muriate of soda, phosphate of lime, and carbonate of lime, with a trace of oxide of iron; whilst those tubercles which had undergone the cretaceous transformation presented inverse proportions of those substances: that is, in 100 parts, of 3 of animal matter, and 96 of saline matter.

80. The *cretaceous transformation* occurs most commonly in those cases where the tubercles have long ceased to exert any hurtful influence on the constitution, this being the reverse of the purulent transformation. This change has been demonstrated to me in several cases, three of which occurred in medical men. I shall briefly allude to one case, as having lately come before me. A young man, about twenty, evinced symptoms of incipient phthisis, for which he was recommended to visit the Mediterranean. After being abroad for several years he returned to London in a tolerably good state of health. I attended him some time afterwards for an attack of partial bronchitis, during which he expectorated two or three cretaceous masses, evidently transformed tubercles: He recovered, travelled abroad and returned again to this country, where he continued for a considerable time in apparent health. He was afterwards attacked — about twenty years subsequently to the appearance of phthisical symptoms — by an acute disease of which he died. Upon examination, a considerable number of cretaceous tubercles were found in the lungs, which were not otherwise much diseased. We may generally infer that, when symptoms have announced the presence of tubercles, and have subsequently disappeared, the patient continuing afterwards to enjoy tolerable health, the cretaceous transformation of the tubercles has taken place. M. ANDRAL states, that he has occasionally found, surrounding the cretaceous tubercle, a tissue that appears shrunk, and occupies less space than in the healthy state; indicating that, in some cases at least, this tissue has actually been in part destroyed and absorbed, along with a tubercular mass, whose remains appears as a calcareous concretion. This inference is further confirmed by the fact of tubercles being sometimes found, even in the softened state, containing hard gritty particles, formed of phosphate of lime, mixed with the curdy masses floating in the puriform fluid.

81. Tubercles being produced from a morbid state — whatever kind that may be — of the nutrition, and interstitial exhalation constantly going on in the different organs of the body, it follows that they may be developed in any one or more of them. As to the particular tissue in which this morbid exhalation or secretion takes place, some doubt may be entertained. The very general diffusion of tubercles and other considerations indicate the cellular tissue, either free or

combined, as its seat; but although this tissue may be the most common, it is not the only seat of this secretion. It should, however, be stated that Dr. BARON refers it to the radicles of absorbent vessels, and some circumstances seem to support his opinion. M. ANDRAL remarks on this topic, that "the submucous, subserous, and intermuscular tubercles are evidently developed, in the cellular tissue. It would be difficult to prove that the same holds good of tubercles of the spleen; and we can admit it only by analogy in those of the brain, liver, kidneys, testicles, and lymphatic glands." As to the lungs, we may readily detect tubercles in the substance of the cellulo-vascular tissue which forms the parietes of the air-vesicles, and the extremely small bronchial tubes opening into them. An apparently tuberculous matter, he adds, has been found in the interior of cavities lined with mucous membranes, without the presence of ulceration. This rare occurrence leads to the inference that tubercles may be secreted in other tissues than the cellular; and proves that, as they arise from a morbid state of the interstitial exhalation constantly proceeding in the different organs and tissues of the body, they cannot be referred to a single tissue or system merely, however generally diffused through the body such tissue or system may be.

82. *B.* THE STRUCTURE OF TUBERCLES AS DISPLAYED BY THE MICROSCOPE.—The lower microscopic powers furnish but little information as to the intimate structure of tubercles; and those who have employed the highest powers differ as to the most important topics connected with this subject Even the results published at different times by the same observers differ remarkably. Thus CANSTATT states, that "every trace of organised structure is wanting to tubercle-matter: vessels which have been observed in it, either belonged to false membranes developed in its bounds, or were the remains of tissues accidently destroyed." And he adds that, "microscopically observed, the peculiar fine tissue of organised bodies, growing by intus-susception and composed of cellular cytoblasts, is wanting to tubercle-matter. A mass, composed, in great part, of imperfect cells easily broken down, is only distinguished. As the tubercular deposit increases from without, the tubercle grows by apposition, and in this way increases from tubercle-molecule to tubercle-mass, formed of layers placed concentrically. The outer layers more recently deposited consist of a more transparent matter. This mode of growth forms an essential distinction between tubercle and idioplastic parasitical formations, which increase, like organised beings, by intussusception, whilst tubercle grows more like inorganic bodies." But CANSTATT afterwards states that, contrary to his earlier view of cell-formation being wanting to tubercles, he has since convinced himself of the existence of cells, as VOGEL describes them; and he recalls what he had formerly said about the amorphous condition of tubercle. He adds, that "SCHARLAN describes the tubercle grains as an accumulation of minute corpuscles about the $\frac{1}{3000}$th of a line in size, which in many situations form a dark blackish grey granulated mass; and that GLUGE and CERUTTI give a similar description. The observations of KUHN as to the papillary appearance of tubercle under the microscope, rest on an illusion. The peculiar bodies, described by GRUBY in tubercular sputa, as consisting of whitish-yellow lenticular, round, or oval corpuscles, from one to ten times larger than pus-corpuscles, of a darker yellow, and of concentric layers, are not confirmed according to others, and appear to have been a misconception. Tubercle consists, at its commencement, according to I. VOGEL, of an amorphous mass, which almost disappears in acetic acid, and even in ammonia, and in which the rudiments of cell-formations are already found; this mass gradually passes wholly into tubercle cells, of very different sizes, from the $\frac{1}{80}$th to $\frac{1}{400}$th of a line, and of different forms." VOGEL further states that these cells are either rounded, or oval, or long, or drawn out, tailed, or string-like, irregular, &c., with very pale walls, with nuclei which are larger in the small cells, smaller in the larger; and that they often contain fat granules, or granules of dark pigment. The walls of these cells become more transparent, or wholly disappear by means of acetic acid, whilst their nuclei remain unchanged. Both the cells and the nuclei are destroyed by ammonia. VOGEL, notwithstanding, agrees with VETTER in considering that, although the presence of cellular bodies is proved in tubercles, these bodies may be distinguished from the usual formative cytoblasts; the organic elements found in tubercles being rather the rudimentary portions or altered remains of other tissues, than independent bodies.

83. The individual corpuscles of tubercle are, according to RUETTE, composed of an integument and a nucleus; and are rather larger than blood-globules. BREDOW says that he could find no integument to the corpuscles. SCHERER found the firmer or outer portion of tubercle to consist of a multitude of little granules and nuclei mixed with a few irregular larger cell-granules; but no fibrous structure, nor free fat corpuscles. The softened inner portion contained nuclei of granular corpuscles which were as large as the round nuclei of the more solid outer part. GERBER asserts that tubercles consist almost entirely of granules, from $\frac{1}{3000}$th to $\frac{1}{250}$th of a line in diameter; but that, with the granular matter, nucleoli, nuclei, or cells are mingled in a quantity in proportion to the amount of fibrin which the exuded fluid contains.

84. Mr. GULLIVER states in his edition of GERBER, that tubercular matter consists "chiefly of irregular corpuscles and cells, with oblong and circular nuclei;" and that it is "void of regular structure, being composed of shapeless fragments, and a granular matter formed of minute spherules very variable in size." In Mr. PHILLIPS' work he is quoted as follows:—"In the human subject, it appears to me that crude tubercular matter, from whatever organ obtained, differs as little in its microscopical, as in its general and chemical characters. When examined by the aid of the microscope crude tubercular matter can scarcely be said to present any regular structure, as it is merely made up of minutely granular matter, oily spherules, some shapeless albuminous flakes, or shreds, and a few irregular corpuscles; the latter are probably nothing but effete, or shrunken primary cells." (p. 41.)

85. M. LEBERT remarks that tubercles present microscopical elements proper to themselves, and distinguishing them from all other morbid pro-

ducts. In this respect they obey the general law, that all existences which are really different pathologically, differ also in respect of molecular composition. Tubercles, according to M. LEBERT, contain a great quantity of molecular globules varying in diameter from $\frac{1}{1000}$th to $\frac{1}{500}$th of a line, a hyaline substance which unites their elements, and a species of corpuscle which gives them a peculiar character. These corpuscles are of irregular angular form, vary in diameter from $\frac{1}{300}$th to $\frac{1}{500}$th of a line, and generally present a well defined edge. Their interiors are yellowish, slightly opaline, and often contain molecular granules distributed through their substance: they never contain true nuclei, which are so common in cancerous globules, and so constant in those of pus. Acetic acid, which renders the latter transparent, and displays nuclei within them in a very distinct manner, renders the tuberculous corpuscles also more transparent, without disclosing true nuclei in them. If water be added to the tuberculous corpuscles to make them float, their form is seen to approach that of an irregularly polyhedral sphere, instead of being flattened like the globules of pus or cancer. They are numerous, and present so many super-imposed layers in the best microscopical preparations, that it is necessary to have observed them repeatedly, and with a clearly defining magnifying power of from 400 to 500 diameters, in order to acquire an accurate notion of their characters.

86. The ordinary element of tubercle, according to Dr. GLOVER, in whatever situation this deposit may occur, is the granular corpuscle. "Many tubercular masses are composed almost wholly of this matter, which varies in size, from about the bulk of a blood-globule to about, perhaps, $\frac{1}{10000}$th of an inch in diameter. These corpuscles are generally of a somewhat yellowish colour; and when magnified by the highest power (610 diameters), show, occasionally, spots in their substance, which may possibly, in some cases, be nuclei." Mixed with these, which he believes to be in some instances altered cells, in other cases new formations, there are the following elements: —1st. Epithelial scales, variously altered, observed in lung-tubercle; 2nd. Fat globules; 3rd. Crystals of salts; 4th. Portions of the destroyed tissues, which sometimes assume singular shapes; 5th. Cells, which also appear to belong to the old tissues; 6th. Large granular and corpuscular masses of the most irregular forms. The description of tubercle by Dr. J. HUGHES BENNETT has been adduced at another place. (See SCIRRHOUS AND OTHER GROWTHS, § 71.)

87. Microscopical examinations of tubercle and scrofulous matter have also been made by Mr. DALRYMPLE, and published by Mr. PHILLIPS, as follows: — "The whole material is composed of disintegrated tissue; granular molecules; irregular exudation corpuscles, in which the nucleolus is seldom to be recognised; and a considerable quantity of oil globules, which may be abstracted by boiling in æther, and recovered by evaporation on a plate of glass."

88. The following remarks of Mr. DALRYMPLE are *diagnostic of tubercular matter*, inasmuch as they distinguish this matter from the *pus-globule*, and from the exudation-corpuscle: — "In acute or chronic inflammation of the *glands, in otherwise healthy subjects*, in whom no particular morbid disposition exists, the *exudation corpuscle*, by what appears a law of vitality, proceeds to the development of a cyst around the nucleus or cytoblast; and this nucleus even splits into two or more, and hence a *pus-globule* is formed. At this point, however, the process stops, and the pus-globule subsequently disintegrates, and is resolved into granular and fluid matter. During the development of the cell and fissure of the nucleus, a pus-globule may be said to be an organic and vitalised body, deriving its means of increase from the blastema around.

89. "The *exudation corpuscle*, however, is capable of a much higher degree of organisation; and, under favourable circumstances, the cell-germ produces its cell; the cell elongates, and either fibre or filament is produced, as in the healing of a wound.

90. "In *scrofulous matter* it appears that the exudation corpuscles do not possess even that feeble power which induces the further change into pus, and therefore it passes from the nucleolated cytoblast into an irregular granular body (disintegrated), the elements of which, by some further chemico-vital process, resolve partially into oil or fat globules." (p. 40.)

91. *C.* THE CHEMICAL COMPOSITION OF SCROFULOUS AND TUBERCULAR MATTER. — M. SIMON remarks, that chemical analysis has hitherto thrown very little light on the nature of *tubercle*, or on the mode of its formation. A tubercular mass, analysed by PREUS, contained 19·5 of solid constituents, and 80·5 of water, the former were composed of a substance resembling casein in its relations towards acetic acid and heat, a fat containing cholesterin, and a very small quantity of salts. SCHERER, according to Dr. DAY, states that crude pulmonary tubercle yielded little fat or extractive matter, showing that the morbid process was not far advanced. An ultimate analysis, after the most careful removal of salts and foreign constituents, gave: —

Carbon	53·888	Which corresponds with the Formula C 43, H 35, N 6, O 13.
Hydrogen	7·112	
Nitrogen	17·237	
Oxygen	21·767	

Hence tubercle in a crude state may be regarded as *protein* (C 48, H 36, N 6, O 14), from which five atoms of carbon, one of hydrogen, and one of oxygen, have been removed. SCHERER has made several other analyses of tubercles from different parts of the body; but they differ as little as, and sometimes less than, the above from the composition of protein. (See Dr. DAY's Transl. of SIMON's *Animal Chemistry*, vol. ii. p. 480, &c.)

92. GUETERBOCK has also analysed tubercles from the neck, from the bronchi, and from the lungs; and he states that they contain, — 1st. Albumen in small quantity; 2nd. Pyine differing from casein; 3rd. Phymatine, a species of osmazome, which, according to him, is proper to tubercles, and which is soluble in water and in alcohol, is precipitated by the acetate of lead, but not by galls, nor by the solution of the sulphate of copper; 4th. Fatty matter, not only cholesterin, but also saponifiable fat. As to Phymatine, a principle which GUETERBOCK says is proper to tubercles, its existence requires to be proved by other analyses. Tubercular matter has been chemically examined by BOUDET, HECHT, and

others .but the analyses of PREUSS and SCHERER appear to be most satisfactory; and to them M. LEBERT has given the preference.

93. ii. THE BLOOD IN SCROFULA AND TUBERCLES has been long considered popularly, and with much truth, to be of a poorer quality than in healthy constitutions. SIMON states, that the blood is deficient in solid constituents, especially in fibrin and in corpuscles. The primary causes are probably due to a deficient formation of chyle, and to the influence of a most unhealthy atmosphere. According to DUBOIS, the blood of scrofulous subjects coagulates slowly, the clot is small, soft, and diffluent; the serum is thin, and often a reddish colour. Under the microscope, some of the corpuscles appear devoid of colour at the edges only, some entirely colourless. Their size is not materially changed, but they appear flattened, spherical or cylindrical. Hence he infers that there is a deficiency of the salts in the blood of scrofulous persons. Mr. PHILLIPS remarks that, in every case in which he examined the blood of scrofulous subjects, the coagulum was relatively small, the serum large; the clot unusually soft, almost diffluent; in a few instances only, it was tolerably firm. In most cases the proportion of globules was considerably under the healthy standard. The fibrin had not generally undergone much change. He states that there was in most instances a considerable increase in the proportion of albumen and of the salts, the latter being in some cases nearly double.

94. The state of the blood now mentioned certainly exists, as far as my own observation has extended, especially the deficiency of red globules and the increase of albumen. I have not found any diminution of the salts; but the fibrin has varied with the state of vascular action, an increase of this action and the association of inflammatory action with the scrofulous or tubercular lesion augmenting the quantity of this constituent. As external scrofula becomes more and more chronic, and as suppuration or ulceration continues, the blood becomes more watery and poor, the red globules diminish, and the clot is more soft. These results are also observed during the advanced stages of internal tubercles, as shown more fully when treating of *Tubercular Consumption*. The changes in the blood are well described in Dr. GLOVER's work on Scrofula, to which I refer the reader.

95. iii. THE STATES OF THE SECRETIONS AND EXCRETIONS in scrofulous and tuberculous persons have not been satisfactorily investigated; and unless in protracted and in the most severe cases, they probably do not present any very obvious changes from those usually observed even in healthy persons.—(*a.*) The frequency of a fatty state of the liver in persons who have died of scrofulous disease or of tubercular consumption, has been imputed by some to a deficient secretion of bile, and to the circumstance of the *bile* containing a much less quantity of its fatty constituents, which are not separated from the liver by means of its secreting function. But the changes, whatever they may be, which exist either in the liver, or in the bile, or even in the chyle, are to be imputed chiefly to the previous alterations of organic nervous energy, to the state of the blood, especially in respect of the amount of red globules, and to the amount of function performed by the lungs.

96. FISCHER and DISSE contended, that scrofulous persons suffer from disordered states of the gastric secretions; and the existence of a specific scrofulous dyspepsia was not only asserted, but minutely described, by certain recent writers, who considered this supposition not merely a remarkable distinction, but as an important discovery. That the gastro-intestinal secretions should be changed more or less from the healthy condition throughout the course of scrofulous and tubercular affections, cannot be doubted. Organic nervous power, upon which secretion, assimilation, and nutrition are chiefly dependent, is more or less impaired in scrofulous constitutions; and hence the digestive and related functions must necessarily be co-ordinately disordered, whenever the usual causes of disorder of these functions are in operation. As organic nervous energy is more and more weakened, and as the blood becomes thinner, or poorer, or more watery, owing to the consequent impaired digestion and assimilation, the usual phenomena attending these states of disorder may be expected to appear from even the slightest causes.

97. (*b.*) The state of the *urine in scrofula* has been investigated by CANSTATT, DISSE, and GLOVER, but they have remarked no definite change in this excretion when the urinary organs are not especially implicated, and when the functions of the skin are not materially disturbed. When, however, these functions are either impaired, or arrested, or, on the other hand, much increased, the urine is generally vicariously changed accordingly, not merely in quantity, but also as respects its ingredients; much, in either respect, depending upon the nature and amount of the ingesta.

98. According to SIMON, the urine of children of the scrofulous diathesis differs in the majority of cases from the normal state. It is usually pale, but becomes deeper coloured when there is vascular excitement. Its specific gravity is lower than in health, and it is often much more acid than the urine of children usually is. SCHÖNLEIN states that the principal changes in the urine of scrofulous persons consist in the diminution of the nitrogenous constituents—the urea and uric acid, and in the appearance of the non-nitrogenous oxalic acid, and occasionally, but more rarely, of benzoic acid. The acids are frequently so abundant, that the urine, upon cooling, deposits copious sediments of the oxalates, and these sediments sometimes form renal and vesical calculi. The frequent occurrence of oxalate of lime or mulberry calculus in children is well known. Dr. PROUT has remarked, that half the stone-cases occur before the age of full puberty.

99. iv. The PATHOGENESIS OF SCROFULA AND TUBERCULOSIS. — *A.* The operation of the causes above described, either singly or in succession, or more or less in combination, is manifestly such as tend *to weaken the organic nervous energy*, and thereby to depress the digestive, the assimilating, the nutritive, and consecutively the depurating or excreting functions. The organic nervous system actuates these several functions, and is itself influenced by the physical agents which perpetuate animal existence,—by external agents, and by the ingesta. The causes which have been now

considered, whether those acting on the parents of the scrofulous subject, or upon the scrofulous individual himself at a very early age, or even at later periods—whether external, or internal—whether hereditary, congenital, or acquired—have all a similar tendency, namely, directly to depress, or to exhaust organic nervous or vital power; and thereby to impair vital resistance, to prevent the processes of repair consequent upon morbid vascular action, and to arrest the formative or organising tendency of the exudations produced by this action. Not only is there a disposition to a dyscrasy—to a solution of vital cohesion, observable in parts the seat of scrofulosis, but there is also an absence of the formative effort in the fluids exuded by morbid actions in scrofulous constitutions. The state of vital power or endowment in the several tissues or organs of scrofulous persons, appears insufficient both for the healthy or sthenic actions or functions these parts should perform, and for the organisation of the fluids or matters effused from their vessels. Hence the changes which the exuded matters undergo, neither favour, nor are followed by, organisation even in its lower grades; and, most probably the fluid itself is exuded from the capillaries of a kind and in a state which indisposes it to organisation. It consequently undergoes changes independently of any formative tendency, these changes being chiefly those of increase by aggregation of the tubercular molecules, until the irritation produced by the morbid deposit affects the enclosing tissues, and thereby favours the progressive changes produced in this deposit, as mentioned above (§ 78.).

100. It must be manifest, that, admitting the more immediate and direct operation of the causes of scrofula on the organic nervous system, and through this system upon the functions which it actuates, the *blood* itself necessarily must be, sooner or later, or even from an early period of the action of these causes, most materially altered; and thereby become furnished with the elements of the morbid materials, or even with these materials themselves, which are deposited in certain parts in preference to others, owing to the states of organic nervous, or vital power in these parts. That the blood is actually so changed is not very demonstrable in many instances, especially early in scrofulosis, or where the scrofulous taint only exists; but that it is more or less changed, in the majority of instances, even in these, is made evident by careful inspection and by chemical analysis, the secretions and excretions ultimately becoming more and more altered. It has been repeatedly shown, that not only is organic nervous power more or less weakened, but the blood also is manifestly thinner, or poorer as respects the amount of red globules, and even otherwise altered. Thus the *organic nervous influence* in the first place, and *the circulating fluids* in the second place, are the *prime factors* of both the scrofulous taint, and of the more diseased grades of this taint, as manifested by external or internal tuberculosis.

101. *B. The origin and source of scrofula and tuberculosis* may be readily inferred from what has been advanced above as to their *causes*, and as to the *operation* of these on the organic nervous power, on the digestive and assimilative functions, and upon the blood and vascular system generally. When it is considered, that the state of the circulation in the capillaries, the changes of the blood in them, and the exudations which take place from them, are controlled most remarkably by the organic nervous influence, it will be admitted that to this influence or power the primary morbid change should be imputed; and that, in whatever tissue or part this power is the most impaired, or most languidly exerted, or most depressed by external or physical causes, or by internal ingesta, or most affected by hurtful agents, in these tissues, parts, or organs will this primary change of nervous power affect the capillary circulation as respects not only the state of the capillaries themselves, but also as regards the conditions of the blood they contain, and of the exudations from them. Whilst, therefore, the *origin* of the scrofulous taint may be ascribed to the organic nervous system, and to its influence upon the digestive and assimilating functions, the *source* of the morbid deposit may be traced to the state of the blood, and to the exudation which takes place from the capillaries in the seat of lesion.

102. *C.* The *nature* of the changes constituting scrofula and tuberculosis, must be manifest from the character of the causes which produce these changes primarily in the organic nervous system, and consequently in the assimilating functions and in the blood itself. These changes are, as respects this system, a state of depression, or of weakness, or asthenia; as regards the assimilating functions, a state of impairment or insufficient action; as respects the blood, a deficiency of red particles, and an increase of albumen; and as regards the capillary circulation, a languid condition, amounting to congestion in some organs or parts, and varying in grades of passiveness, and occasioning an exudation or deposit of the morbid matter of tubercle in the tissues, whose capillaries are thus more especially affected.

103. v. As to the state of Vascular Action producing Tubercles, much discrepancy of opinion exists. There are, however, three well-ascertained facts connected with the origin of these bodies, calculated to lead to an accurate opinion on the subject:—1st. Their frequently simultaneous formation in different organs; 2nd. The very frequent absence of any appreciable symptoms of antecedent excitement, increased action, or congestion of the capillaries of the part in which they originate;—and 3rd, their very general origin in states of the frame remarkably characterised by deficient vital energy and by imperfect development; and consequently upon *causes*, as shown above (§ 99. *et seq.*), which, as respects both the parents and the offspring, depress or exhaust vital power and sthenic action, and impair the assimilating and nutritive functions.

104. (*a.*) *The presence of tubercles in several organs at the same time* has been explained by supposing that the tubercular matter has been absorbed from the original seat of its formation, introduced into the circulation, and re-secreted or deposited in the parenchyma of other organs, the case being the same with tubercular matter as with pus. I will not deny the possibility of this occurring; but there is no decisive proof of it. Besides, this can hold good only with regard to the consecutive formation of tubercles, and not in respect of their simultaneous occurrence in distant organs. It would be more consistent with the close observation of the phenomena of their origin to refer the

latter, and even the former mode of their production to defective vitality of the capillaries, and to a modified state of the exhaling function these vessels are constantly performing in the different structures; this function being modified by the defective state of vital endowment of those vessels. The general diffusion of this primary morbid condition — this constitutional taint — will account for the simultaneous, as well as for the consecutive affection of several organs; the varied conditions of the textures and organs occasioning the diversities which are met with in respect of frequency of liability of each, the succession of attacks, and various other peculiarities occasionally met with.

105. (*b.*) *The Localisation, or the Origin of Tubercles locally, has been ascribed to inflammatory action* by several pathologists. M. BROUSSAIS (*Exam. des Doct. Méd.* T. i., prop. 168.) said that he had never seen tubercles in the lungs without antecedent inflammation; and Dr. ALISON, in some very able papers published between 1820 and 1830, supported a nearly similar doctrine. This enlightened physician concludes, "that scrofulous tubercles may be, and often are deposited in consequence of inflammatory action; and therefore, that as, on the one hand, scrofulous diseases may be, in many cases, prevented by applying the *tonic regimen* to persons of feeble constitution, but not yet affected with actual disease; so, on the other, they may also be frequently prevented by the early and prudent use of the *antiphlogistic remedies* in those in whom the slight inflammatory complaints so often preceding them have already appeared."

106. *In opposition to the inflammatory doctrine of tubercles*, M. BAYLE, who has directed much attention to this formation in connection with pulmonary consumption, has expressed himself very decidedly. He contends, that tubercles are never an effect of inflammatory action, not even in its chronic form; and M. LAENNEC observes, that extensive observation proves, that the development of tubercles results from a general disposition of the frame, that it takes place without previous inflammation, and that when inflammatory action co-exists with tubercles, it is generally posterior to them in date. Moreover, the simultaneous occurrence of tubercles in nearly all the organs in the body, is opposed to the doctrine of their origin in inflammation. According to M. LOUIS, inflammatory action, in some cases, influences the production of tubercles, and, in other cases, it seems to take no part in their formation. He further remarks, that inflammation and tubercles occasionally co-exist without being necessarily dependent on each other; and that tubercles may be developed in the lungs independently of inflammatory action of any grade, whether in the parenchyma of the organ, or in the mucous membrane of the bronchi. A similar opinion has been published by MM. LEVEILLÉ and ROSTAN. In addition to the argument derived from the *post-mortem* appearances, I may state, that in no class of the human species are tubercles more frequently met with than in negroes and other dark varieties of the species, particularly when they are removed to a colder climate than that of which they are indigenous; and yet inflammatory diseases are seldom observed amongst them. Whoever has had occasion to observe the character of morbid actions in these races, must have remarked their immunity from inflammation, and their general liability to diseases of a very opposite character, particularly to those attended with diminished vital energy, and to tubercular deposits.

107. MM. ANDRAL, LOMBARD, CRUVEILHIER, BECKER, and SCHROEDER VAN DER KOLK, entertain a doctrine intermediate between the foregoing — an opinion not far different from that espoused by Dr. ALISON, but leaning less to the inflammatory doctrine of the disease. They, however, admit the occasional origin of tubercles in a state of inflammatory congestion of the capillaries, preceded and accompanied by a constitutional disposition to tubercular productions. M. CRUVEILHIER, in his conclusions from the experiments, wherein he produced, artificially, miliary tubercles, by injecting fluid mercury into the veins of dogs, considers that these bodies are formed in consequence of a stasis of the fluid in the capillaries followed by a morbid secretion.

108. The opinion offered by M. GENDRIN appears accordant with extensive observation of the causes, phenomena, and results of tubercular disease in man and the lower animals, and agrees with the experience I have had of this disease, particularly at the Infirmary for Children. This able pathologist states, that tubercles, during the whole of their early stage, are entirely independent of every form of inflammation; and that it is not until they begin to soften that the tissue surrounding them begins to be inflamed, this tissue then secreting a fluid which aids in dissolving the dense matter composing them.

109. It may be inferred, from an intimate view of the tubercular formation, that it consists of an exudation of a matter essentially different from that which is produced by inflammatory action; and that it proceeds from a modified state of the exhalent process constantly existing in living structures, owing to a weakened state of the vital endowment of the capillaries in the seat of the disease. The coagulating lymph produced by inflammation affecting the healthy constitution is susceptible of organisation; the concrete matter forming the tubercular secretion is entirely insusceptible of this process, the changes which it undergoes being chiefly the result of decomposition, and of the admixture with it of the fluid exuded by the vessels of the tissue immediately surrounding it. Accompanying inflammation, of whatever grade, attacking the sound or untainted constitution, there is always a disposition to organisation of its products; but in tubercular disease an opposite tendency obtains, — the capillaries exude a fluid, undergoing changes in which this vital process has no share, and inducing irritation and disorganisation in the parts in contact with it. In the former state of disease, the vital endowment of the capillaries is exalted, and an emanation of it serves to organise the inflammatory products; in the latter this endowment is diminished, and insufficient to prevent either decomposition of the matters secreted by it, or disorganisation from the slightest causes of irritation.

110. As to the opinion which refers tubercles *to irritation in the organ* in which they are seated, little need be said, especially as the abettors of this doctrine have failed to define the meaning they attach to the word irritation, and even leave it uncertain whether they apply the term to the nerves, or the extreme vessels of the part, or to

both. Even those who confine the term to the extreme vessels, leave us to doubt whether the terminations of the arteries, or the radicles of the veins or of the lymphatics, are its seat, and to puzzle ourselves with conjectures as to in what particulars irritation of a capillary vessel differs from inflammation, or whether it differs at all or not. Taking it, however, for granted, that those who espouse the doctrine of irritation, mean by the term an excited state of the capillaries, giving rise to augmentation of their organic action, but falling short of acute inflammation, it may be remarked, that neither the symptoms by which this state is recognised during life, nor the effects it induces in the tissues, are altogether similar to those produced by tubercles. It is true that tubercles, when once they are formed, occasion irritation in the tissues surrounding them; but this is an effect, and certainly not a uniform cause, of their formation. It is possible, also, that irritation, in any of the acceptations of the word, may sometimes occasion the development of tubercles in an organ; but this result will never take place unless with the concurrence of other causes, many of them proper to the constitution of the individual, or at least pre-existent to irritation; for wherefore should tubercles result from this vaguely supposed state, rather than from any other of the numerous changes to which it is so generally supposed to give origin, if it were not because other pre-existent and concomitant influences caused tubercles to be formed in preference to any other morbid production or lesion

111. The arguments which have been here stated in opposition to the opinion that tubercles proceed from irritation of the capillaries in the part in which they are formed, apply with still greater force to the idea of their origin in inflammation. After every consideration I can give the subject, I would infer that tubercles originate in a modification of the nutrient and exhalent functions constantly going forward in the organic structures, owing to defective vitality of the capillaries; and that when irritation, or inflammation, or congestion occur, they are either accidental and concurrent causes, or effects resulting from the accumulation or decomposition of the morbid exhalation in the particular form constituting tubercular productions. But this local morbid condition is only a part of a more general constitutional vice, manifested not only by the organic nervous energy, but also by the digestive, assimilative, and circulating functions, and even by the state of the blood.

112. vi. OF THE IDENTITY OF SCROFULA AND TUBERCLES. — This topic would not have required discussion, if several authors of repute had not disputed the identity of those morbid conditions, more especially SCHARLAN, SCHÖNLEIN, Dr. EVANS, Dr. CHAPMAN, and Mr. PHILLIPS. Dr. GLOVER has ably reviewed the arguments which these writers have urged in support of the differences between them. But the operation of similar causes, hereditary, parental, and exciting; the appearance of both forms in the same family, and even in the same individual; the same diathesis, constitution, and states of the blood and secretions, and a similar grade of vital endowment, of vital cohesion, and of vital resistance, characterising both diseased manifestations; the same tendency to dyscrasy, and the same indisposition to the healthy restoration of parts in both; and the same principles of treatment, and even the same agents and means, being the most successful for the cure of both forms of lesion, are circumstances which so manifestly show identity, that an opposite doctrine cannot with due reason be supported. The differences which have been urged, moreover, do not invalidate the doctrine of the identity of these states of disease; they have reference merely to difference of seat, and of epochs of life during which the one is more prevalent than the other.

113. But the great question, the solution of which ought to put an end to all discussion, is this, — Is the morbid structure of external scrofula identical in its characters with that of internal scrofula, or tuberculosis? or, in other words, Is the external manifestation of scrofula by enlarged lymphatic glands the same in its minute structure as the internal manifestation of it by tubercular deposit? Preliminary to the answer which I shall give, I should state that scrofula is a term which may be, and has been, given to a diathesis—to a constitution—to a certain appearance, described above (§ 5. *et seq.*), and which may exist without any manifest external or internal lesion — without any special disorder, although often accompanied by some internal affection usually denominated scrofulous. Now, this external affection, whatever it may be, most commonly, however, seated in the lymphatic glands, is, as respects the morbid change, the same as that found in other or in internal parts, no further differences being observed than such as necessarily result from difference of seat. Dr. GLOVER remarks (and others have stated the same, both before and after he wrote), that the only difference which he has been able to detect between tubercular matter and the degenerated substance of scrofulous glands, is in the existence of a greater number of bodies presenting the appearance of thickened and translucent or opaque cells in the latter case. But the microscopic elements are in both instances the same. The results of chemical analysis also point out the identity of the two kinds of formation. M. LEBERT, whose researches into the intimate nature of scrofula and tuberculosis are most minute, patient, and trustworthy, states that the tubercular deposit in scrofulous lymphatic glands is the same as in other organs (vol. i. p. 534.).

114. CANSTATT remarks, that the material and physiological causes of scrofula and tubercle, their progress, &c., scarcely leave a doubt of their identity; nevertheless respect for those who entertain a different opinion, suggests an inquiry into the force of their arguments: — *a*. They urge the difference of form between scrofulous formations and tubercle, the former being often indeterminate, the latter more rounded or provided with an envelope. But this is chiefly owing to the structure of the tissue in which the deposit occurs. In some cases, the lymphatic glands present in their interiors, cysts filled with tubercular matter, comparable with isolated tubercles; and I may add, that the differences, as respects the great tumefaction of scrofulous glands and of their surrounding tissues, depend chiefly upon the nature and structure of these glands, and upon their connections, not only with the vascular system, but also with the lymphatic vessels belonging to them, and with the adjoining cellular tissue.

115. *b.* It has been asserted, that while scrofulous glands may be injected, tubercles show no vessels in their structure. But the injection of these glands does not prove the injection of the tubercular deposit in them; this deposit, whether taking place in them, or occurring elsewhere, being without vessels, excepting such as belong to the tissue in which it is found.

116. *c.* The incurability of tubercular formations in the lungs has been adduced as a proof of difference between external scrofula and tuberculosis. But tubercles, in the lungs or elsewhere, may heal as well as the forms of external scrofula, and according to similar processes. Scrofulous formations, like tubercle, may pass into calcareous masses, or thus degenerate; or they may be thrown off by ulceration, or their suppuration and the deposit of a reparative tissue may be followed by cicatrisation. The chief circumstances which prevent internal tuberculosis from healing so frequently as the external malady, are the causes inducing the former, the frequently continued operation of these causes, the nature of the structures affected, the constant action of the atmosphere as respects tuberculosis of the lungs, as well as the other lesions which often precede, accompany, or follow this morbid formation.

117. *d.* It has been contended that, because persons below puberty are most frequently the subjects of external scrofula, and those more advanced in life are most subject to tubercular consumption, therefore there is a difference between them. But, as I have shown above, tubercles may occur at any age, however early, and are, in fact, very common in young children, whilst external scrofula may also be developed at any age; and it may be added, that open external scrofula before puberty does not prevent tubercular formations in internal parts subsequently. Tubercles may exist, in an early stage, both internally and externally in the scrofulous diathesis, and whilst concurring causes may develope the external malady, the internal may remain latent, or be but imperfectly manifested, or may appear long subsequently, or even not at all, if the causes usually determining the development of this lesion are avoided. Of 312 scrofulous children, only 47 were found without tubercles in the lungs. LUGOL remarks that scrofulous children have always tubercles in the lungs. This inference is too general; but I have seldom inspected the body of a child who has died of a non-tubercular disease, and who manifested the external signs of scrofula, without finding internal tubercles in one or other stage of development.

118. *e.* It is almost unnecessary to pursue the subject further; but one argument frequently urged is, that either form of the disease may run in families without the other form being met with. This statement is, however, pushed beyond the truth. Such an occurrence is not very frequent, nor are the exemptions contended for either complete or many. PORTAL considered both scrofula and phthisis identical, yet he admitted that either may be transmitted in families in preference to the other. Dr. HOLLAND remarks that "in the scrofulous temperament, even more than that of gout, we have a remarkable diversity in the forms of the disease and the organs it attacks." I readily agree with Dr. GLOVER in remarking that, in respect of this topic, "on the one side all is clear, pathological and decided, founded on facts of essential relation; while on the other side we have doubtful assumptions, and at best non-essential relations."

119. vii. DISEASES ATTACK THE SCROFULOUS DIATHESIS WITHOUT BEING ESSENTIALLY SCROFULOUS OR TUBERCULAR, ALTHOUGH MORE OR LESS INTIMATELY ALLIED TO EITHER.—Not only may several diseases attack the scrofulous diathesis without being essentially tubercular; but this diathesis may predispose to them, and render them more chronic and difficult of cure. Thus, while I believe in the identity of scrofula and tubercles, I consider the latter as a development or manifestation of the former, arising out of one or more of the causes above described; and further infer that various local affections, more or less resembling or allied to scrofula, may occur, either in delicate persons, especially in cachectic children, who are not of a scrofulous taint, or in those who are actually scrofulous, without being necessarily or actually scrofulous, or attended by external or internal tuberculosis.

120. 1st. *Various Affections are occasionally met with in delicate or cachectic subjects, which are not truly scrofulous in their nature,* but which, when occurring in this diathesis, are influenced by it, as stated hereafter (§ 125.). It is not uncommon to observe in delicate or cachectic children, chronic inflammations, especially of the periosteum or bones, to follow slight injuries, or other affections to follow slight causes, without any essential characteristic of being scrofulous. Various chronic affections of the skin, of the mucous membranes, or of the joints, or of the eyes, may also appear in these subjects, without presenting the scrofulous elements, although they most frequently do present them when occurring in the scrofulous diathesis.

121. 2nd. *Other Affections still more nearly allied to scrofula may take place in this diathesis,* and yet be without any very manifest tubercular formation. Parts may become inflamed, go on to suppuration or ulceration, and present no further scrofulous characteristic than the long duration of the disease and indisposition to cicatrisation. Caries of the bones, chronic ulceration of the skin, consequent upon eruptions, eczema, lupus, &c.; ozæna, various states of gastro-enteric irritation or inflammation, diseased follicular glands, prolonged leucorrhœa, chronic bronchitis, affections of the eyes and eyelids, flexures and other diseases of the spine, enlargement of the joints, softening of the structures, &c., are very common in the scrofulous diathesis, without being attended by tubercles; and although not strictly scrofulous, are more or less allied to it when occurring in this diathesis.

122. 3rd. *These affections, however, are often attended or followed by tuberculosis* either of adjoining glands or of internal viscera, especially in the scrofulous diathesis; the occurrence of these appearing to complicate, or to develope the tubercular deposit. On the other hand, the tuberculosis may have existed previously and been followed by either of those, which, in some instances, when allowed to proceed, or when accompanied by a discharge and by appropriate treatment, may supersede, or partially or altogether subdue, the tubercular malady.

123. The affections now mentioned, whether occurring in the scrofulous diathesis, without manifest external scrofula, or internal tuberculosis, or complicated with either external or internal scrofula, are most frequent and most obstinate in persons whose powers of life are constitutionally low or exhausted, and the vital cohesion or tone of the tissues are originally weak or otherwise impaired. They may occur, in this state of the frame, either independently of true scrofula or tuberculosis, or in an intimate association with tubercular deposits in some part or parts of the body — they may exist without tuberculosis, or they may be associated with it, although not necessarily depending upon it. They ought, therefore, not to be considered as varieties of scrofula, but should be separated from this affection; inasmuch as, although they are often met with in the scrofulous diathesis, they frequently also occur in weak constitutions or exhausted states of the frame, in which this taint, or any actual manifestation of tuberculosis does not exist.

124. viii. THE SCROFULOUS TAINT, OR TUBERCULAR CONSTITUTION, NECESSARILY PREDISPOSES TO, AND INFLUENCES THE COURSE AND TERMINATION OF, OTHER MALADIES. — However obvious and important this assertion may appear to many, and however frequent the observing and truly scientific physician may have had occasion to remark this influence, to regard its results, and to modify his practice accordingly, still the facts which this proposition comprises have too often been either altogether unrecognised or at least partly unheeded. The states of vital power and resistance throughout the frame, the conditions of the circulating and secreted fluids, and the vital cohesion of the tissues, of scrofulous and tubercular persons, are generally such as to predispose them to several maladies, and to modify the course and terminations of most of those which may afflict them.

125. *A. As respects the predisposition which this taint occasions*, it may be remarked that it is the most influential when no open or external manifestation of scrofulous disease has appeared; for when such disease is developed and is proceeding, internal or constitutional maladies are less apt to occur, or supervene only after the more energetic operation of their exciting causes. The external affection, especially when attended by a discharge, has often the effect of a derivant, and sometimes becomes a safety-valve to the economy in circumstances which might otherwise be attended by risk, as when exposed to the causes of endemic, epidemic, or constitutional disease. In other circumstances, especially when the morbid taint is present, without any active or developed external disease, the constitutional powers are too languid — too feeble, to resist the invasion of causes and the production of effects, which would have been successfully resisted by more powerful energies; and the causes of disease, especially such as are depressing and contaminating, would make more rapid, more marked, and more dangerous impressions and changes in the scrofulous constitution, than in any other. Experience furnishes many proofs of the truth of this position. Local injuries, such as bruises, contusions, concussions, the impression of cold, infectious and epidemic agents and influences, contagious and contaminating miasms and secretions, &c., are less successfully resisted by scrofulous persons than by others; and when the effect is produced by either of these, or by other causes, it is generally either more marked or more prolonged, and remedied with greater difficulty. The full development of the predisposing and exciting causes of disease which I have attempted under a different head renders it unnecessary to remark further on this topic, at this place, than to recal attention to its importance (see art. DISEASE, § 18. *et seq.*).

126. *B. The Course and Termination of many Special States of Disease are very remarkably modified and aggravated by the scrofulous taint.*—(*a.*) That this is more especially the case in respect of *Inflammations* is generally admitted; but there is every reason to believe that the evil is not confined to this class of diseases. As regards inflammations, it may be remarked, that not only are they rendered more chronic in the scrofulous diathesis, although the acuteness, the severity, or the activity of these maladies, is seldom so great as in the vigorous and healthy constitution, but their consequences are more dangerous, both as respects the changes produced in the structures affected, and as regards the state of the products of inflammation. In the strumous diathesis, softening, infiltration, tubercular deposition and disorganisation of the inflamed structures readily take place; and restoration to the healthy condition is either very slowly or imperfectly accomplished. The fluids effused are much less prone to assume a state of partial or complete organisation than in the healthy constitution, but they are more disposed to undergo changes of a more injurious nature — to assume a dirty curdy or cheese-like appearance, or a tubercular character, or to become the nidus of further changes. It would appear as if the products of inflammation in the strumous diathesis proceed from a lower grade of vital action, than in healthy constitutions; and that, whilst these products in the latter cases are more prone to organisation owing to a certain degree of derived vital endowment, those resulting from scrofulous inflammatory action are much less prone to this change, owing to this endowment being so much less as to be altogether insufficient for this end. The inflammatory products in scrofulous persons are thus not only different from those in healthy constitutions, even at the moment of their formation, but they become still more different after their exudation, owing to the partial absorption or exhalation of their more watery constituents, to the aggregation of their albuminous, mineral and other elements, and to the consecutive irritation they produce in the surrounding or containing tissues.

127. (*b.*) In all *fevers* also, especially such as are malignant or infectious, softening of mucous and cellular parts, ulceration of the intestinal mucous surface and follicular glands, effusion from internal surface, and disorganisation from loss of the vital cohesion of the structure, especially in parts which are pressed upon, or are irritated by external agents, more readily and more remarkably supervene in the scrofulous, than in the healthy constitution. In all acute and chronic inflammations or congestions of the *brain, lungs*, and their *membranes*, reparation is delayed, more difficult, or is imperfect; and either effusion, or tubercular depositions, with their various unfavourable concomitants and consequences, are much more apt

to supervene in the scrofulous than the healthy constitution.

128. (*c.*) The influence of scrofula is less manifest in aggravating the course of other diseases, than in originating many, both of a functional and of a structural kind. All those maladies which present a tubercular character, and several of those which consist of adventitious formations, or chiefly of alteration or vitiation of the nutrition of a part, may not only, in a great measure, proceed from this diathesis, as regards some cases, but also be aggravated or even altogether transformed as respects other instances. But it is unnecessary to pursue this topic further at this place, as it, as well as several allied topics, are more fully discussed in the articles DEBILITY, DISEASE (§ 87. *et seq.*), INFLAMMATION, and in other parts of this work.

129. IX. THE ASSOCIATED ALTERATIONS AND COMPLICATIONS OF SCROFULA AND TUBERCLES. — From what has been stated above, almost every tissue or organ of the body may be the seat of tuberculosis; but there is a very wide difference in the frequency of the occurrence of this lesion in different organs or parts (§ 135.). I have stated, with respect to the *pathogenesis* of scrofulosis or tuberculosis, that there are modifications of organic nervous power, of capillary vascular action, and even of the blood itself, which are necessary preludes to the alteration in the textures especially affected; the local change being chiefly characterised by congestion of the capillaries and the exudation or deposit from the blood, constituting the tubercular matter (§ 109.). External scrofula most unequivocally presents itself in the form of enlarged or diseased lymphatic glands; and as respects them, it has been asked by an able writer, MR. PHILLIPS, "Is this state of the gland determined by the circulation within it of blood which has undergone change, or is it independent of the blood? Does the blood fit the organ to receive the deposit, or does the organ fit itself? This is an important question, but of very difficult solution. Important too, with reference to treatment; because, if the action set up were purely local, means might be taken to change it and render it unfit for the deposit. If the action depend only upon a general contamination of the blood, how comes it that all the lymphatic glands are not equally affected? It is notorious that they are not."

130. But the alteration of the blood here insisted on, is only one part of the morbid condition, and, as respects the succession of changes producing this condition, a more or less advanced part. These changes have already been stated (§§ 101. 109.), and it has been shown, that the constitutional changes — the changes in the organic nervous power, in the capillary circulation, and in the blood itself consecutively upon the state of assimilative function, are such as tend to predispose the lymphatic glands, as well as various other textures, to experience these changes in a more manifest degree, especially upon the operation of various causes, whether constitutional or local, whether depressant or irritant, and to favour the supervention of further changes in the capillary circulation of these parts, and ultimately to produce the exudation in them of the materials constituting the tubercular deposit.

131. The cause or source of the swelling and hardness presented at an early stage by external scrofulous glands, has been a topic of discussion. This has been ascribed to increased vascularity in the first instance, and to the morbid exudation in the second. This is probably the case; but it is not so manifest, that the vascularity is owing to increased action: it is more probably the result of interrupted circulation — of congestion, not merely of the blood in the capillaries of the gland, but also of lymph in the proper lymphatic vessels of the organ, aided more or less by an exudation of molecules or tubercular materials or elements from the congested capillaries, which materials are incapable of organisation, and which, by their aggregation, become more and more manifest, as shown above (§ 109.). As these accumulate they often change the capillary congestion which partly occasions them, to inflammatory irritation, followed by the usual products of inflammatory action; and thus a state of simple congestion of the glands, induced in a constitution such as I have described, is converted, by the material exuded from the congested capillaries and by the irritation this material occasions, into a state of inflammatory congestion, with all the consequences of this state in its more chronic forms. It should not, however, be admitted that the swelling existing in these cases is altogether owing to the changes within the gland itself; for much of it arises from congestion, increased vascularity, and serous effusion in the cellular tissue surrounding the affected gland. The greater tendency also of the external glands to become enlarged and ultimately even inflamed, in connection with tubercular deposits in them, may be ascribed to the greater exposure of these glands to physical influences and agents, and to local or external irritants, affecting not merely their state of vital power and action, but modifying also the condition of the blood circulating through them.

132. A careful examination of a scrofulous cervical gland by MR. DALRYMPLE is thus described in MR. PHILLIPS's work:—"This enlarged gland appears to consist of a general parenchyma in a state of chronic inflammation, surrounding irregular masses of yellowish white matter, more immediately the subject of examination. In direct proximity to the edges of this white material, the blood-vessels are seen to be more enlarged and congested than elsewhere, and in some parts the capillaries are occluded with coagulated blood. The parenchyma, which at first sight appears healthy, is, on examination with high power, found to be infiltrated with exudation corpuscles, resembling lymph globules. The natural texture of the gland consists of its proper corpuscles, filamentous tissue, blood-vessels, lymphatics, and nerves. In this morbid specimen, everywhere is the filamentous tissue infiltrated, and its fibres separated by innumerable exudation corpuscles, and the proper corpuscles of the gland are similarly surrounded and imbedded. As the parenchyma is nearer to the whitish matter, so proportionally do the proper corpuscles of the gland become more indistinct, the filamentous tissue more obscure, the blood-vessels irregularly dilated and filled with red globules, and they at last disappear insensibly. The exudation corpuscles are more numerous, but irregular in size and shape, and interspersed with minutely granular matter." (p. 46.)

133. *A.* The *modifications and associations of scrofula and tuberculosis* are to be ascribed chiefly

to the pre-existence or association of various grades of capillary congestion, sometimes passing into chronic inflammatory irritation, in the seats of the tubercular exudation. But it may be asked whether or not this exudation ever occurs without these antecedent states of congestion or of inflammatory irritation? There is no sufficient reason to infer that this deposit may not take place without either of these alterations of local vascular action; for miliary tubercles and grey granulations are often found in tissues, the capillaries of which present no material alteration. It may, therefore, be inferred, that tuberculosis may appear — 1st, Independently of locally increased vascular or capillary action; 2ndly, Consequently upon capillary congestion; 3rdly, In connection with inflammatory irritation, or inflammatory congestion, of the part; and, 4thly, Where the inflammatory diathesis is associated with the scrofulous, or where tuberculosis is associated with inflammation of a sub-acute or chronic kind. Whilst, however, either of these states of local vascular action may precede or accompany the morbid deposit or exudation constituting tubercles, it is not improbable that this deposit as often becomes the cause, as shown above (§§ 110, 111.), of the vascular disorder, inducing such disorder where it has not previously existed, and increasing or developing it where it had already commenced.

134. *B. The Complications of Tuberculosis* are so diversified that a particular notice of them cannot be given at this place. It must be obvious, that the state of constitution described above to constitute the scrofulous diathesis, will favour the occurrence of various disorders, both without or independently of any tubercular deposit, and in more or less intimate association with it. It has been shown (§ 123. *et seq.*) that the scrofulous taint favours the occurrence of several diseases not actually scrofulous or tubercular, and that it modifies the course and termination of others; and various affections have been enumerated above (§§ 119—121.), as being met with in delicate constitutions, which are not scrofulous, in the scrofulous diathesis without evidence of tubercular deposits, and in this diathesis complicated with these deposits in one or more organs. A knowledge of such occurrences, either as now stated, or as particularly noticed above, is sufficient to suggest the chief indications of treatment which these associations will require in respect of their individual forms.

135. x. THE COMPARATIVE MANIFESTATIONS OF TUBERCULOSIS — *A.* AS TO THE COMPARATIVE FREQUENCY OF TUBERCULAR FORMATIONS IN THE DIFFERENT ORGANS OF THE ADULT BODY much interesting information has been adduced by MM. LOUIS, LOMBARD, and ANDRAL. — (*a*). The lungs hold the first place, in respect of frequent liability to the disease: next, the small intestines. M. LOUIS found (leaving the lungs out of the calculation) in 358 adult subjects, tubercles in the small intestines, in a *third* of them; — in the great intestines, in a *ninth*; — in the mesentric glands, in a *fourth*; — in the cervical glands, in a *tenth*; — in the lumbar glands, in a *twelfth*; — in the prostate, in a *thirteenth*; — in the spleen, in a *fourteenth*; — in the ovaries, in a *twentieth*; — in the kidneys, in a *fortieth*; — in the uterus, in *one case* of them only; — in the cerebrum, in *one case*; — in the cerebellum, in *one case*; — and in the ureter, only in *one case*. There was no account taken, in those cases, of the occurrence of this production in the testicles or in the bones, which is not uncommon. Out of all of them M. LOUIS found only one case in which tubercles were found in different other organs without existing in the lungs.

136. In one hundred *adult* subjects, Dr. LOMBARD found, not counting the lungs, tubercles in the intestines in 2 cases; — in the mesenteric glands, in 19; — in the bronchial glands, in 9; — in the cervical glands, in 7; — in the spleen, in 6; — in the lumbar glands, in 4; — in the sub-peritoneal cellular tissue, in 4, — in the maxillary glands, in 3; — in the glands of the anterior mediastinum, in 3; — in the sub-arachnoid cellular tissue, in 2; — in the spinal chord, in 2; — in the false membranes of the pleura, in 2; — in those of the peritoneum, in 2; — in the intercostal muscles, in 2; — in the ovaries, in 2; — and in the parietes of the gall-bladder, in the liver, cavity of the pleura, posterior mediastinum, vertebræ, ribs, omentum, uterus, prostate, sub-mucous tissue of the bladder, cerebrum and cerebellum, medulla oblongata, kidneys, and vesiculæ seminales, *one each*.

137. M. ANDRAL states that his observations as to the relative frequency of tubercles in the different organs of the body, observe nearly the same order as that indicated above, excepting that he has found, in more cases than M. LOUIS, tubercles in other organs without detecting them in the lungs. He has also discovered them in the false membranes of the pleura and peritoneum in a greater proportion of cases than M. LOMBARD. M. ANDRAL has found them in the intervertebral cartilages in one case; and he adds very interesting information respecting the relative frequency of tubercles in the different organs of children.

138. (*b.*) *Tubercles, in Children*, more frequently affect a number of organs at the same time than in adults. They occur more commonly, in this class of subjects, in other organs, without existing in the lungs. It will, moreover, be seen, from the following results furnished by M. LOMBARD, that the parts most commonly affected in adults are not altogether those which are so in children. In a hundred *young* subjects he found tubercles in the bronchial glands, in 87 cases; — in the lungs, in 73 cases (in 30 of which, but one lung was affected, viz. the left in 13, and the right in 17 cases); — in the mesenteric glands, in 31 cases; — in the spleen, in 25; — in the kidneys, in 11: — in the intestines, in 9; — in the nervous centres, in 9; — in the cervical glands, in 7; — in the membranes of the brain, in 6; — in the pancreas, in 5; — in the gastro-hepatic glands, in 5; — in the sub peritoneal cellular tissue, in 5; — in the spleen, in 4; — in the inguinal glands, in 3; — in the cellular tissue under the pleura, in 2; — in the lumbar glands, in the sub-mucous tissue of the bladder, in the omentum, in the parietes of the gall-bladder, and in the false membranes of the pleura, *one case* each. It may be remarked that, in these hundred cases, tubercles were not found in the liver in a single case; and in all the cases of adults the liver contained tubercles in one case only.

139. M. PAPAVOINE found, in 50 children in which the seat of tubercles was ascertained, 49 in which they existed in the bronchial glands; — 38

in the lungs;—26, in the cervical glands;—25, in the mesenteric glands;—20, in the spleen;—17, in the pleura;—14, in the liver;—12, in the small intestines;—9, in the large bowels;—9, in the peritoneum;—5, in the brain;—3, in the cerebellum;—3 in the cerebral membranes;—3, in the pericardium;—2, in the kidneys;—1 in the pancreas, 1 in the vertebræ; 1 in the stomach. In 10 instances tubercles were present in the bronchial glands without having been found in the lungs. The relative frequency of tubercles in the abdominal organs is very different in M. PAPAVOINE's table from that furnished by M. LOMBARD. The above show that they are more frequent in the bronchial glands of children than in the lungs; whilst in adults the proportion is much greater in the latter, than in the former. Besides, in this class of subjects, they are seldom met with in these glands without being observed in the lungs; but they are often found in adults, in the lungs without there being any in the glands.

140. *B.* AS TO THE RELATIVE FREQUENCY OF TUBERCLES AT THE DIFFERENT PERIODS OF LIFE, without reference to the organs in which they are seated, the following inferences may be adduced:—1st. Tubercles are very rarely developed in the fœtus; but several instances have occurred to me, particularly in the lungs of those whose mothers were suffering from phthisis during gestation:—

141. 2nd. During the first months after birth, tubercles are likewise rare. In the lungs of an infant (attended by Mr. NICHOLSON of Davies' Street and myself) born of a mother far advanced in consumption, affected with cough from the moment of birth, and that died instantly from profuse hæmorrhage from the lungs under three months, the lungs were so studded with tubercles, many of them large and softened, as not to collapse upon opening the thorax. Tubercles existed no where else. This state of disease in so young a subject was rare, and the nature of the result still rarer.

142. 3rd. From nine months to five or six years, tubercles are very frequent. According to M. LOMBARD, tubercles are found in only one-eighth of the children who die between the ages of one and two; in two-sevenths of those between two and three; in four-sevenths of those who die between three and four years of age; and in three-fourths of those who die between the ages of four and five years. From my experience at the Infirmary for Children, I am of opinion, that M. LOMBARD calculates the proportions as too high in respect of children between the ages of three and five, and too low in respect of those below two years. However, the results may vary somewhat between London and Paris. There can be no doubt of the fact mentioned by this writer, that at the age of four or five years a greater number of organs are simultaneously affected with tubercles, than at either an earlier or later period of life. I believe that these tubercles begin to form about the period of dentition and weaning, the change which is then made in the diet of infants, being the chief cause of their formation; and that the fatal effect most commonly does not occur until about the fourth or fifth year.

143. 4th. From the sixth to the sixteenth year tubercles are much less frequently met with, than from the third to the sixth, but they occur more frequently than under the age of two years. The results which I have stated in the preceding paragraphs differ much from those furnished by M. LOMBARD. But they are in many respects confirmed by the researches of M. PAPAVOINE made at the Hospital for sick Children, at Paris. This physician found, in 408 children under fourteen years of age affected with tubercles, 73, or $\frac{1}{5}$-$\frac{1}{6}$, under two years;—64, or $\frac{1}{6}$, from two to three years of age;—46, or $\frac{1}{9}$, from three to four;—35, or $\frac{1}{12}$, from four to five;—32, or $\frac{1}{13}$, from five to six;—29, or $\frac{1}{14}$, from six to seven;—24, or $\frac{1}{18}$, from seven to eight;—16, or $\frac{1}{25}$, from eight to nine;—18, or $\frac{1}{31}$, from nine to ten;—12, or $\frac{1}{37}$, from ten to eleven;—24, or $\frac{1}{18}$, from eleven to twelve;—10, or $\frac{1}{41}$, from twelve to thirteen,—11, or $\frac{1}{40}$, from thirteen to fourteen; and 14 whose ages were not ascertained.

144. 5th. After puberty tubercles again become more frequent, but only as regards the lungs, the intestines, and some parts of the lymphatic system, especially the lungs. Does this increased frequency arise from the new source of exhaustion which comes into action in the development of the genital organs? I think that it does. According to M. ANDRAL, males are particularly subject to tubercles between the ages of twenty-one and twenty-eight; whilst females are more subject to them before the age of twenty. After these periods, tubercles are much less frequently met with until from about the 38th to the 45th year in females, and from about the 40th to the 55th year in males, when a slight increase is again remarked, particularly in females.

145. *C.* AS TO THE COMPARATIVE LIABILITY OF THE SEXES, it has been generally admitted, that the female is more frequently the subject of tubercles than the male sex, and this certainly holds in respect of children. But according to the data furnished by M. LOMBARD, the difference of liability of adults is extremely small. He states, that in 52,857 persons who died of tubercles in the lungs, 26,124 were males, and 26,733 females. M. LOUIS, however, found the proportion of adult males to females affected, to be 70 to 92. M. PAPAVOINE considers the difference to be still greater between the two sexes, in children. According to the returns of the Registrar General the proportion of deaths by tubercular consumption is about 24 males to 28 females.

146. *D.* WITH REFERENCE TO THE OCCURRENCE OF TUBERCLES IN THE LOWER ANIMALS, M. ANDRAL observes, that "several animals have, in common with man, the tendency to tuberculous affections. Amongst the mammalia, animals using the most different kinds of food are equally subject to these affections—the carnivorous as well as the herbivorous. Amongst the carnivorous, however, there is one species, in which, though we frequently examine their bodies, genuine tubercles have never been discovered: I mean the canine species. Is this because the dog lives in freedom in a climate that agrees with him, and where he can enjoy exercise in proportion to his strength? And is it because the lion happens to be in opposite circumstances, that he dies in this climate affected with tubercles? Most of the animals in which we have proved the existence of this affection, are either transported from a hot to a cold climate, where they are deprived of liberty and

exercise (as is the case with monkeys and parrots), or confined in damp places, without sun, and almost without air (cows, pigs, house-rabbits), or exposed either to continual alternations of heat and cold, or to constrained and violent exercise, as the horse." The want of due ventilation, or a too frequently respired air, a too hot or close, or a too cold and humid atmosphere, and the close confinement so opposite to the habits of these animals, are not without their influences.

147. xi. ARE SCROFULA AND TUBERCULOSIS MORE PREVALENT NOW THAN FORMERLY? This question hardly can be answered in the present state of knowledge, as the data on which rational speculation respecting it, either are altogether wanting, or are of so loose a kind as to prevent the possibility of arriving at a sound conclusion on the subject. Mr. PHILLIPS has indeed entertained this topic, but with reference chiefly to external scrofula, or the "King's evil," as so denominated in former times. The principal data he has adduced are the loose reports of the bills of mortality of former years, and the numbers said to have received the royal touch during the reign of the second Charles. It is obvious that no conclusion can be drawn from these respecting the comparative prevalence of the several forms of tuberculosis in former and recent times. A careful consideration of the relative influence of the principal causes of scrofula in past ages and at the present day, may suggest vague ideas on the subject; but as certain of these causes were, perhaps, more influential formerly than now, whilst other were less so, and whilst some have even recently come into operation, others have nearly or altogether disappeared, the question must be viewed as not admitting of solution, however important the considerations which it involves.

148. IV. THE PREVENTION OF SCROFULA AND TUBERCULOSIS. — It is obvious, that the *prevention of a constitutional taint*, which is not limited to the individual thus tainted, but which is very commonly propagated to his offspring, in some one or other of its forms or contingent effects, is much more important than even the cure of these effects when they come under the eye of the physician; and it is equally obvious, that the prevention consists in the avoidance of the causes producing this taint — these causes being fully exposed above (§ 13. *et seq.*), with the implied object of enabling the medical adviser, or whoever is concerned in the matter, carefully to avoid them — this avoidance having reference to the parent or parents, and to the offspring for successive generations. By no class of diseases are the misconduct, the imprudence, and the want of judgment of the parents more severely punished than by this — by none so distressingly, hopelessly, extensively, and successively, until the tainted race is almost or altogether extinguished. Instances illustrative of the misery — of the numerous miseries — resulting from the thoughtless, the ignorant, the worse than culpable intermarriages of scrofulous persons, or even by the marriage of a healthy person with one who is thus tainted, crowd upon my recollection, and are too common — too well known to every one who may read this — to require enumeration. The subject is sufficiently illustrated by the calm consideration of every thinking mind.

149. Several of the causes which I have discussed above, require only to be known to be guarded against, and certain of them may readily be avoided by careful persons. Others cannot be avoided by those most concerned, or who are about to become their victims; but they may be altogether removed by those who have the power of inflicting them. Richly endowed public institutions or schools may be so managed, and have been so managed, as to become hot-beds for the generation of scrofulous or tuberculous diseases. The same remark often applies to private as well as public schools, and not merely as respects food and clothing, but also as regards ventilation, exercise, light, sunshine, and purity of air. The constitutions of the industrious poor are sacrificed on the altar of gain, and governments lend their aid to the immolation, that they may receive the unrighteous support of the priests of mammon in perpetuating their power, their patronage, and the aggrandisement of their satellites. The physical and moral ameliorations, which salutary measures would impart to those most in want of them, cannot be afforded out of the luxuries and patronage which aristocratic governments bestow on their supporters and themselves. The inevitable tendencies of extreme taxation and of an immense national debt are to reduce the middle classes to the lowest, to render the poor still poorer, more wretched and more debased, to augment the wealth and the influence of capitalists and contractors, to render these last more dishonest and overreaching; and, as the general result, to multiply beyond calculation the chief sources from which scrofulous and tubercular maladies, the physical curses of society, derive their origins. Dishonesty, moreover, in professions, trades, and the several relations of life, — the necessary consequence of the foregoing — is daily increasing and leaving its victims physically and mentally reduced, thereby favouring still more the invasion of the most hopeless forms of the maladies under consideration. These are results which are manifest to the common-sense thinker, however they may be controverted by political economists, and by political and statistical haranguers, who will prove or disprove whatever may suit their arguments, their purposes, or their motives, and even bring an array of figures and numbers to their support, without caring for the accuracy of the amounts which they thus imposingly marshal.

150. *The Hygeienic Treatment of Scrofula* should, however, not be limited to the careful avoidance of the causes above described, whenever this object can be attained; but be extended to the use of such rational means as may prevent the full development of the scrofulous taint, and of its consequences, in those who may evince it in any grade, in childhood or infancy, and more particularly in the children of scrofulous parents. If this latter *indication* be carefully pursued, and if judicious means be employed, much may be accomplished, especially if the tainted subject be early submitted to these measures. As respects the *infants* of scrofulous parents, hygeienic treatment should be adopted as early as possible. If the taint exist on the mother's side, a wet-nurse of healthy constitution, and suitable as to the state of her milk, should be procured; and if this be impossible, ass-milk immediately upon being drawn from the animal, or goat's milk may be given. Recourse may otherwise be had to milk

expressed through a bag containing suet, as advised by Dr. PARIS. Great care, especially as respects food and clothing, should be taken of the child at the periods of dentition and weaning. At these epochs, especially the latter, ass-milk, milk boiled with suet—cod-liver oil, or sweet oil, on the surface of the milk — small doses of liquor potassæ, or of BRANDISH's alkaline solution, or of the iodide of iron, in the syrup of sarza, especially in older infants or children—salt-water bathing, the temperature being adapted to the strength of the child—and warm flannel clothing over the whole body, are the most beneficial hygeienic means.

151. The support of animal warmth, and the animal heat derived from a young healthy nurse, are most beneficial to delicate, and more especially to scrofulous infants, and the more so the younger the child. An emanation of organic nervous power, as well as of warmth, may be furnished from this source to the delicate infant. The lower animals afford this protection to their young until growth is considerably advanced; and yet the young animal which is most helpless in infancy, and requires this the most, is the oftenest deprived of it, or is allowed to remain no longer in the bosom of its nurse than when it is suckled. During the coldness or coolness of night, and often in a chamber much below the usual temperature of the sitting apartment, the infant is often allowed to sleep in a cot altogether apart from the curtained and warmer bed of the nurse.

152. Change of air, or the migration from one locality to another, according to the circumstances of the case, the age of the patient, and the season of the year; removal from crowded towns or situations; residence near the sea-coast, in a temperate and dry air, and on a gravelly or sandy soil; sea-voyaging in some cases; sleeping in large airy chambers; exercise in the open air, the enjoyment of light and sunshine during the waking hours, and limiting sleep to the hours of darkness, are generally of great service, especially in advanced childhood, and during the progress to puberty. Cold-bathing, particularly sea-bathing, frictions of the surface, a generous diet, with a due proportion of animal food, and regular meals, are also most beneficial in the early periods of life. Whilst these means are pursued, the digestive and assimilative functions should be promoted, whenever they are insufficiently performed, by stomachic and tonic aperients, as the compound decoction of aloes, with the compound steel mixture, or the compound infusions of gentian and senna; and the use of unnecessary stimuli or stimulating beverages, of pork and indigestible meats, of sugar and saccharine substance, should be avoided.

153. As puberty advances, the utmost care should be exercised in all matters which may affect the sexual feelings or desires. A proper superintendence of both sexes ought to be instituted, in order to prevent the tendency to masturbation, which is greater amongst scrofulous constitutions, at this epoch of life, than in others; and which, if practised at all, will certainly develope this diathesis into actual tubercular disease, especially tubercular consumption. A careful supervision should also be exercised, after puberty, in order to prevent attachments being formed between scrofulous persons, or between an individual of this diathesis and one who possesses a healthy constitution. This intention, however, will frequently fail; but where it is attempted amongst the well-informed classes, and the evils consequent upon the neglect of it are duly explained by members of the profession, it will receive attention, and the good results will ultimately become apparent.

154. V. THE MEDICINAL TREATMENT OF SCROFULA AND TUBERCULOSIS.—The medicinal treatment of scrofula consists,—1st. In aiding the hygeienic or regimenal treatment above discussed, when the scrofulous taint is suspected or apparent, especially in early life;—and 2nd. In employing such medicinal agents as are most likely to arrest the progress of the mischief when scrofula or tuberculosis is more or less manifest. In the first case, medicines are chiefly brought in aid to hygeienic means; in the second, they are the principal agents, regimenal means being aids to their operation.

155. i. *In Scrofulous Cases devoid of any very manifest Local Lesion*, in connection with the hygeienic means now mentioned, various medicines possessing an alterative and tonic influence may be used. One of the earliest indications of scrofulous taint is furnished by the weak state of the digestive functions — a state evidently caused by the low condition of organic nervous power; and hence occur indigestion, flatulency, acidity of the prima via, irregular state of the bowels, torpid function of the liver, and consecutively a poor or thin state of the blood. Formerly small doses of blue pill, or of grey powder, with soda or other antacids were given for these, conjoined with stomachic aperients and tonics; and very frequently with marked benefit, which, however, was very often counteracted by the excessive use of sugar and saccharine substances, the injurious influence of these either being not known in these cases, or overlooked. This treatment, first advocated by the truly greatest name in medicine of his day — by Mr. ABERNETHY — was afterwards advocated by his pupil, Mr. LLOYD; and is still one of the best that can be adopted; and has been employed by myself in numerous cases with marked advantage and variously modified. Two grains of grey powder, with one or two of dry carbonate of soda, or four or five of magnesia, with rhubarb and powdered cascarilla or cinnamon, taken once or twice daily, according to the features of the case, were generally most beneficial.

156. In cases which present increased frequency of pulse, with or without the disorder of the digestive functions, the use of the above means, modified to meet the circumstances of the case, will be advantageously assisted by small doses of either the infusion or the decoction of cinchona, with the solution of the acetate of ammonia, sometimes with the ammonia in excess, and the sweet spirits of nitre; or the infusion of cinchona may be given, with moderate doses of the hydrochloric acid and hydrochloric ether. In cases where aperients are required, and when a pill may be taken, PLUMMER's pill may be given at night with soap; and the citrate of magnesia, or the phosphate of soda, in some pleasant vehicle in the morning.

157. On the other hand, when, with disorder of the digestive organs in scrofulous subjects,

there is more or less languor of the circulation and of the frame generally, Dr. GRIFFITH's myrrh mixture — (one of the most valuable medicines in existence) — with the compound decoction of aloes, when the bowels require aid, sometimes with the addition of the solution, or of the carbonate, of potash and extract of conium, &c., will then be found most serviceable.

158. Since the introduction of *Iodine* into practice, there has been no other substance so generally employed as it has been, in some one or other of its preparations, and especially in the form of iodide of potassium. It has superseded the use of mercury even in the combinations mentioned above; and certainly when prescribed in small doses, as I have usually done since 1821, and in conjunction with the solution, or the carbonate of potash, with the mixture just mentioned, or with a tonic infusion, or with some preparation of sarza, it is a valuable remedy; but it is one that may prove injurious if it be given in too large or frequent doses, or insufficiently diluted, or if its effects are not carefully watched in all cases.

159. Where scrofula is suspected or manifest by its taint, rather than by developed disease, other means may be employed, either alone, or in aid of those already noticed, and one of the best, both as a nutrient and as an alterative, is the *Cod-liver oil*. When it is prescribed in full doses for the age of the patient, an alterative mercurial pill or powder may be taken occasionally at night (§ 155.), and an aperient in the morning, in order to promote the functions of the liver and to prevent biliary accumulations; and in cases where the debility is marked, and the surface is pallid and the structures flabby, the use of this oil should be aided by the preparations of iron, or it may be taken on the surface of water containing a few drops of the hydrochloric tincture of iron.

160. In cases of scrofulous taint conjoined with much debility, as well as in those presenting manifest external or internal tuberculosis, various modifications and combinations of the above means may be brought in aid of hygeienic measures. The alteratives may consist of a combination of mercury and of iodine, or of iodine and iron, with preparations of sarza, or with tonic infusions, according to the features of the case, and whilst these are being employed at suitable periods of the day, the cod-liver oil, or vegetable tonics, or bitters, may also be taken. But, in these, the several means, already advised, both for the prevention of the further development of the malady and as regimenal treatment, should not be neglected, according as the peculiarities of the case may suggest.

161. In some cases of external scrofula, when there was a languid circulation, more benefit has appeared to accrue from the internal use of the muriatic or nitric acid, or the nitro-muriatic acids, prescribed in an infusion of cinchona, than from any of the preparations of iodine; whilst in others, a course of two or three weeks of the former has been alternated with a similar course of the latter, with obvious benefit. In some instances also, the muriated tincture of iron, conjoined with an increased proportion of the acid, or with the hydrochloric æther, has been prescribed with the infusion or tincture of calumba or quassia, with even greater advantage than either of the preceding.

162. A combination of small doses of the bichloride of mercury, with the compound or simple tincture, or the decoction of cinchona, or with the preparations of sarsaparilla, has been long recommended both for the scrofulous taint and the more declared forms of tuberculosis; and I have frequently had recourse to it, in one or other of these forms. In non-febrile cases, or where a tonic is required, this combination is often eminently beneficial; and a course of it is generally very advantageously followed, or alternated, by one of either of the preparations of iodine, as already advised (§§ 158. 160, 161.).

163. ii. The *Medicinal Treatment of the more developed States of Tuberculosis* is not materially different from that already recommended; but there is generally required a more appropriate application of the means already mentioned, as well as of others about to be noticed, to these states — to the particular forms and seats of tuberculosis. When the malady affects external parts, as the lymphatic glands, the joints, the bones, &c., then the medicines above advised, more especially those last mentioned, will be found in general most serviceable; and in these the cod-liver oil may also be taken. When the mesenteric glands seem to be chiefly diseased, the preparations of iodine should be given in very small and much diluted doses; and this oil may also be brought to their aid; frictions over the abdomen with oleaginous and stimulating liniments (*Form.* 306. 311.) being additionally resorted to.

164. When the glands go on to suppuration, or when a discharge is furnished by them, or when external sores, fistulæ, &c. appear, then strict attention should be paid to the digestive and assimilative functions, and more especially to the states of the circulation and of the blood. Not only should the former functions be aided or corrected as advised above (§§ 155, 156.), but the blood should be improved whenever it appears to be thin or poor in red globules, by means of the preparations of iron; and of these, the judicious use of the compound steel mixture, or of the iodide of iron in the syrup of sarza, has proved most beneficial in my practice. In all scrofulous cases attended by suppuration or discharge, there is a marked tendency to alteration of the blood — to a state of anæmia, particularly as respects the coloured globules; and hence these medicines are the more required. In all cases also of open scrofulous sores, care should be taken to prevent as much as possible the access of the air to them; as the air not only injuriously affects the diseased surface, but it also alters the discharge from this surface, and renders it more irritating. Local applications, therefore, in these cases, should be employed with the view not merely of removing the morbid action of the part, but also of completely excluding the air, and of correcting the acrimony of the discharge.

165. When scrofula, in any of its open forms, attacks *females*, it is often *complicated* with either a delay of the catamenia, especially about or soon after the period of puberty, or with irregularity of some kind, or an entire suppression of this evacuation. In many instances an obstinate form of leucorrhœa accompanies the catamenial disorder; and not infrequently the scrofulous, as well as the sexual, disease has been induced or aggravated by the baneful vice of masturbation. Due atten-

tion should be paid to this causation, and to this morbid association, as due inquiries on the part of the physician, and a careful supervision by the friends of the patient, may be productive of ultimate success in the treatment, which in general should be chiefly constitutional.

166. In some cases it will be found advantageous to commence the treatment of scrofula, especially when it is internal, or the glands are chiefly implicated, and the tongue is loaded, with a smart emetic, of sulphate of zinc, and to promote the emetic operation by means of the tepid infusion of chamomile flowers; and, having subsequently improved and promoted the secretions and excretions by the alteratives and stomachic aperients already mentioned (§§ 155—157.), to enter upon a course of either of the more energetic medicines as advised above (§§160—162.). When the scrofulous affection is seated in a gland, and has gone on to suppuration and fluctuation, the integuments being thinned and purplish, there can be no doubt as to the propriety of procuring the discharge of the matter by a small incision of the integuments, and of afterwards protecting the orifice from the air. In cases of this kind, as well as in those attended by open sores, the state of the constitution, particularly as respects the blood, should receive attention; and the treatment ought to be especially directed to the improvement of the assimilative powers, and of the blood, whenever they are in fault, either by the means already noticed, or by the other vegetable or mineral tonics generally in use.

167. Whenever any sexual disorder *complicates* the scrofulous taint, or any form of tuberculosis (§ 165.), as will be frequently observed in practice, meddling examinations, *per vaginam*, should not be instituted without sufficient reason. Most of these disorders will yield to the treatment advised for them severally, under their respective heads in this work, especially when conjoined with the medicines found most serviceable in scrofulous and tubercular affections. Indeed the general indications and means of cure most appropriate to the one class are very frequently suitable to the other; and this remark need not be limited to the constitutional treatment, but be extended to the local also.

168. After the operation of an *emetic*, when it is required, the alvine secretions and excretions ought to be duly promoted by a combination of *stomachics* or *tonics* with *aperients* and *alteratives*, due regard being also had to the diet and regimen recommended above (§ 150. *et seq.*). As occasion may offer, the *mineral springs* and *baths* about to be noticed (§ 193. *et seq.*) may either be brought in aid of other internal or constitutional remedies, or may follow the use of these latter, or even be alternated with them.

169. iii. OF THE SEVERAL MEANS RECOMMENDED FOR THE CURE OF SCROFULA AND TUBERCLES. — When a person possessed of common sense hears of the numerous spells, charms, incantations, superstitious rites, &c. so frequently had recourse to in former days for the cure of scrofula, he considers them humiliating proofs of the credulity of the human mind, during ages commonly called dark, or only partially enlightened; and he is induced to form a comparison between those ages and present times, and to draw inferences which will probably be by no means in favour of the former. Superstitious and absurd notions and practices were no more then, than they are now, confined to the lower classes of society, or to the uninstructed mind: and however lowering they may appear to the dignity of human nature, however irrational and impossible the results imputed to them may seem to the thinking, however devoid of those connections which entitle the imputed causes to the credit of the reported effects, when any effect was even loosely observed, still greater absurdities, still more wonderful charms, more entrancing spells, more blind superstitions, and more gross impositions are credited, in this age of boasted civilisation, of scientific advancement, and of mechanical contrivance and invention, and more numerous instances of blind credulity are daily manifested, than in ages of the darkest and lowest mental abasement.

170. Everywhere — in all ranks and classes, in all professions, and even among those reputed to be instructed, or learned, or even embued with science — most absurd doctrines connected with the healing art, human impossibilities, the most ridiculous notions, the most extravagant assertions, are promulgated by knavish impostors, and believed in by credulous multitudes; the impudence of the former and the faith of the latter being the greater, the more devoid of truth these doctrines are, and the more they are opposed to good sense, to true science, and to honest dealing. When we find, as may be found at the present day, in the senate, in the hierarchy, in the judicial bench, — amongst those who govern the country, who interpret and administer the laws, who profess to direct the religious belief of the community, not merely believers in, but also propagators of, the most absurd medical doctrines and medical means — officious meddlers in what they are incapable of understanding — abettors of the knavery of mischievous quacks — can the decadence of true medical science be far off? What is neither honoured nor rewarded must necessarily cease to be sufficiently, ardently, and patiently cultivated. If the impertinencies of the ignorant, the impudence of the vulgar, the professions of the uneducated, are to be esteemed above the acquirements of the scientific and philosophic investigator, there must, at no remote period, be an end of the learning and science of those who shall hereafter assume the office and rank of physician.*

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* It is very generally believed that the patronage of quacks and quackeries — of impostors and of impositions — is to be imputed chiefly to ignorance; but this is only one of several sources to which it should be referred. Credulity, a tendency, even in the incredulous, to believe in whatever is confidently asserted, a disposition to admire whatever is unknown or unexplainable, the faith which many place in the impossible — the Catholic dogma — "Credo quia impossibile est" — have collectively and severally an influence on the minds of the majority — on those who will not take the trouble of looking closely into matters, or of thinking sufficiently for themselves, especially when they are either imperfectly or not at all acquainted with the natures and relations of such matters. It is not a little remarkable that, since the founding of the College of Physicians at the commencement of the 16th century, expressly with the view of preventing the injurious and irregular medical practices of the day, down to recent times, most of the quacks and quackeries, against which the College had to contend, were patronised by Bishops and dignitaries of the Church, and by persons of high rank, as sufficiently set forth in GOODALL's history of the College.

It would appear, at the present day, as if the aberrations of the human mind, apparent in all classes and places, in matters connected with the disorders of the

171. *A. Superstitious practices* have been adopted for the cure of external scrofula since the earliest ages; and have been of various kinds, the oldest being more or less connected with pagan or religious rites, and the most recent with certain medical doctrines and quackeries which influence more or less the faith or confidence of the patient. It is not unlikely that scrofulous sores formed no small part of the external maladies, respecting which so ample a provision was made in the 13th, 14th, and 15th chapters of Leviticus, and for which the means were calculated no less to excite the faith and hopes of the patient, than to benefit the priests, who, in those ages and places of imperfect civilisation, conjoined the healing art with the priestly office. During the earlier epochs of Jewish history, both prophets and priests had recourse to sprinkling with oil and touching the diseased parts for the cure of external sores; and, before the introduction of Christianity into northern countries, the Druids or priests, whilst they undertook the treatment of these affections, most probably adopted the same or analogous means. PLINY, TACITUS, and SUETONIUS furnish some doubtful evidence of touching the sick having been resorted to, as one of the means of healing; and it would appear, from the Scandinavian Eddas and Sagas, and from some German and French writers in the seventeenth century, that the practice of healing external sores by the royal touch existed in the northern countries of Europe as early as the eleventh and twelfth centuries, and was very commonly adopted from those times until the middle of the eighteenth century.* When the age and other circumstances, in which external scrofula presents itself, are considered, it may be safely inferred, that a very large proportion of those who were thus touched recovered at indefinite periods after it was resorted to. The accession of puberty, the influence of the mind on the body, the change of living, of season, of air and scene, and the journey, when this mode of healing was confided in, and various related circumstances, combined to produce no mean constitutional effects, and thereby to remove the local manifestation of the constitutional evil. The transfer of nervine influence from the healthy to the sick, or any other mode of explanation which the modern mesmerist adopts to account for the effect, when effect was observed, could have but a small share, if any, in producing it; but, at the present day, mesmerism usurps the place of the royal touch, although with doubtful efficacy, unless it brings to its aid all the accessories which I have now mentioned, as well as many others aiding more or less in producing a constitutional as well as a local change.

172. *B. The preparations of Iodine* are amongst the most efficacious remedies which can be prescribed for scrofula, when judiciously administered and combined; but, when improperly employed they may be most injurious. I have employed them extensively both in public and private practice from 1820 until the present time; and have generally commenced their exhibition in small doses, and often much diluted, always preferring to give them very soon after a meal. The preparations of iodine I have preferred are, the iodide of potassium, the ioduretted solution of the iodide of potassium or the compound tincture of iodine, and the iodide of iron. The iodides of mercury are much more rarely indicated, and the iodide of sulphur is too irritating. The iodide of potassium I have often combined with the carbonate of potash, or with liquor potassæ, or with BRANDISH's alkaline solution, and sometimes also with preparations of cinchona, or of sarsaparilla, or with one or other of both. The iodide of iron should be given in syrup, especially the syrup of sarsa. When scrofula is associated with syphilis, then the iodides of mercury may be given, or mercury may be prescribed night and morning, or otherwise employed, whilst the preparations of iodine are taken as just recommended.

173. During the exhibition of iodine in any form, especially if continued above a few days, the state and functions of the liver should be carefully watched; for iodine may, by passing directly into the portal circulation, excite, or even irritate, the liver to a very injurious extent. The preparations of iodine may be employed externally in various ways, either to the part affected, or by means of local or general baths. When applied to the diseased gland or part, care should be taken that they do not, by too great concentration, convert congestion into inflammatory action, or otherwise injuriously irritate the part. Baths containing the iodide of potassium, with or without the addition of sub-carbonate of potash, I have often found of much service, especially when brought in aid of internal means. Iodine, even when cautiously prescribed, may disagree with some constitutions. Its operation should therefore be carefully observed. It ought not to be too long employed, without intermitting its use; and, during its exhibition, the urine should be examined and tested, not merely with respect to its acidity or alkalinity, but also as to the presence of albumen; and if the latter appear, the use of the iodides should be relinquished.

174. *C. Mercurials.* — *Mercury*, in the form of *calomel*, *corrosive sublimate*, and *black sulphuret*

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body, were the humiliating inflictions of Providence on those to whom the professions are as a worldly craft, science as a matter of traffic, and learning as an occupation of the memory involving none of the higher manifestations of the mind. The history of human delusion, as to matters medical, and of the fashions which have successively engaged the weak and selfish, respecting the ailments of their debilitated frames, shows that, in an era of luxurious indulgence, of exhausting vices, and of enervating enjoyments, the impudent assertions of impostors have a more powerful influence on the minds and bodies thus emasculated, than the upright and rational advice of scientific and learned physicians. The victims of the former are either incapable of reasoning upon, or are too indolent to examine, the opinions and assertions which they practically adopt; and hence, of the several medical impostures of the present day, the most popular is that one which is the most extravagant in its pretensions, the most abounding in absurdity, and the most deficient in the least approach to truth. "*Probitas laudatur, et alget*" — honesty, however, is hardly praised; but dishonesty and assurance are more than praised — they are worshipped with a fervency equal to the extent of delusion they achieve — to the amount of their success — a success acquired only at the expense of human suffering, and by the sacrifice of human life, but worshipped nevertheless.

* During the seventeenth and eighteenth centuries, the seventh son of a seventh son, and still more the ninth son of a ninth son, divided the laurels with royalty for their success in curing scrofula by the touch; the odd numbers, as well as the rare occurrence of so prolific offsprings in succession, producing the cures as effectually as the high rank of the royal competitors. At the present day, the passes of the mesmerist profess to effect more than either the royal touch or the humbler ministrations of even the ninth son of a ninth son, wherever he may be found.

(Ethiop's mineral), was generally employed for scrofula during the 17th and 18th centuries. MATERNE, BORDEU, MARX, and others, prescribed it not only internally, but also to the scrofulous sores. HUFELAND resorted to mercurials with the belief that they removed the scrofulous irritation by virtue of a law of the animal economy, that different kinds of irritation destroy each other, or, in other words, that one kind of irritation removes, by superseding, the antecedent irritation. But in this he assumes two things, namely, 1st, that the morbid action consists of irritation; and 2nd, that it or any irritation may be removed by an irritant, neither of which he nor any other one has proved. But, whilst HUFELAND and others recommended mercurials, even until they produced salivation in the more obstinate cases, others, with equal justice, contended, with MORTON and GIRTANNER, that they were injurious when carried so far as to occasion salivation; and they were fortified in this by the obvious impropriety of prescribing a debilitating medicine for a disease essentially of debility.

176. At the present day, several other preparations of mercury have been resorted to, especially *mercury with chalk*, the *iodide* and *sub-iodide*, the *bromide* and *sub-bromide*, and the *nitrate*, externally. I have employed several of these, especially the iodides, with results similar to those already mentioned in respect of iodine; but the mercurial iodides require a careful observation of their effects. Mercury with chalk is an excellent alterative, and is often required to correct or to increase the biliary functions. Of all the preparations of mercury, the *corrosive sublimate* is certainly the most beneficial; but it should be prescribed in very small doses, and generally in conjunction with some preparation of sarza or of cinchona; and when thus exhibited, I have found it almost equally efficacious with the preparations of iodine. It was much used by VAN SWIETEN, AKENSIDE, and their contemporaries. I have usually given it with the fluid compound extract, or syrup of sarsaparilla, or in the compound tincture or decoction of cinchona. In the more obstinate cases, a course of the sublimate may be alternated with a course of one of the iodides; and when the bones are at all implicated, this plan will generally prove efficacious, especially when aided by an appropriate diet and regimen.

176. *D. Preparations of Iron.*—Most of the preparations of iron may be given advantageously in scrofula, especially after morbid secretions and fæcal accumulations have been evacuated. The preparations which I have preferred are, the *ammonio-tartrate*, the *potassio-tartrate*, the *ammonio-chloride*, the *saccharine carbonate*, the *iodide*, and the *compound mixture of iron*. Mention has already been made of the iodide (§ 172.). The compound mixture of iron is one of the most efficacious, and I have usually prescribed it with an additional quantity of the carbonate of potash, or with solution of potash, with extract of conium and liquorice. The *sulphate* and *muriate of iron* were generally preferred by THILENIUS, THOMANN, and HUFELAND; and when the former can be taken in a pill, and when the latter is given in the form of the tincture of the sesquichloride, either of these is very beneficial. These preparations are most serviceable where there is any tendency to anæmia or chlorosis, and not less so when scrofula is associated with hysteria or disorder of the catamenia in any form.

177. *E. Chlorides.*—(*a.*) *Chloride of Barium.*—Dr. ADAIR CRAWFORD first contended for the anti-scrofulous operation of the muriate of baryta, and in this he was supported by FERRIAR, THOMANN, PEARSON, BUCHOLTZ, WESTRUMB, HUFELAND, PINEL, ARMSTRONG, WENDELSTADT, VERDIER, &c. But CHAPMAN, PORTAL, JADELOT, and others, have not fully confirmed the opinions which were formerly entertained respecting it. The muriate of baryta had fallen into neglect for some time, its use having been superseded by medicines which were found more efficacious and less irritating to the stomach, when Dr. PIRONDI advised a more active employment of it. He prescribed six grains of the medicine in four ounces of water, and directed a table-spoonful to be taken every hour, excepting the hours before and after a meal. He increased the dose by six grains every day, until a drachm was given; and the patient was restricted to a vegetable diet and water. Having had some acquaintance with Dr. PIRONDI, I was induced to make a partial trial of this plan in a few cases, but I could not succeed in giving more than ten or twelve grains in the twenty-four hours, and then it was given more diluted than he advises. Its irritating effects on the stomach frequently prevented me from prescribing more than six or seven grains in the twenty-four hours. It appeared to be more efficacious when given in moderate doses, either soon after or with the meals, than when taken in larger doses in the intervals. According to Dr. GLOVER, who makes a very favourable mention of the chloride of barium in scrofula, the *bromide* and *iodide* of *barium* has the same physiological action with the chloride, the iodide, moreover, acting energetically on the uterine system.

178. (*b.*) *Chloride of calcium* was formerly much employed against scrofulous swellings and sores, and in similar states of solution to those in which the chloride of barium was prescribed. BEDDOES, ODIER, FRANK, and HUFELAND have made favourable mention of this substance. The last-named of these writers, however, considered it more irritating than the chloride of barium, and that it, therefore, should be used more cautiously. Dr. SIMMONS stated it to be inefficacious, and Mr. PHILLIPS seems to be of a nearly similar opinion. "FOURCROY and the Dutch physicians had much confidence in its power over scrofula. BIETT for many years made much use of this medicine in the treatment of the scrofulous patients of St. Louis, without observing those inconveniences which are frequently attendant upon the use of baryta in full doses. It is the base of the anti-scrofulous nostrum of NIEMANN. I have frequently used it in the following form:—a drachm of this chloride to twenty drachms of distilled water, of which a tea-spoonful was taken in milk two or three times a-day. I have carried the dose up to two tea-spoonsful, but not exceeded that dose. I am not satisfied that it has any evident action upon scrofulous glands, but it is more generally tolerated than the chloride of barium." (PHILLIPS, op. cit., p. 282.)

179. (*c.*) There are other *chlorides*, as the *chloride of potassium*, the *chloride of zinc*, &c., which, if judiciously employed, may act beneficially in scrofulous swellings and sores. The *chlorate of*

potass has been very frequently prescribed by me in this, and in other cachectic diseases since 1819, and I can recommend it as one of the substances most deserving adoption in scrofulous affections. Dr. GLOVER remarks that his experiments prove the *chlorides of potassium* to be much more energetic than the corresponding compound of sodium, although not so powerful as the iodide of potassium. "There is scarcely a doubt but that the chlorides, bromides, and iodides of the same bases produce effects identically similar in kind, differing only in degree. The bromide of potassium is more powerful than the chloride, less active than the iodide. Not being so apt to occasion nausea as the latter substance, it may be used in cases where this might disagree."

180 *F.* Solutions of *chlorine—aqua chlorinei*—and chlorinated solutions of the alkalies have considerable influence in the more cachectic states of scrofula. Dr. GLOVER observes that the strongest analogy, in physiological and medicinal properties, exists between chlorine, bromine, and iodine; and that any one of these bodies is capable of producing the effects which can be obtained from another; but that the different forms in which we must use them give rise to differences in action. "Thus the very slight solubility of iodine almost precludes its use in watery solution; and the convenience with which solutions of *bromine* can be prepared renders this body peculiarly adapted to form lotions for external application." Mr. POTTER and Dr. GLOVER have proved the utility of bromine used externally; eight or twelve minims of bromine being added to a pint or half a pint of water. I have directed one drachm of bromine to eight ounces of distilled water; and from five to twelve drops of this solution to be taken in any suitable vehicle internally; and from one to two drachms of the solution to eight ounces of water for external use.

181. *G. Alkalies* have long had a great reputation for the cure of tuberculosis and scrofula. They are much praised by HAMILTON, BLANKARD, KIRKLAND and FODÉRÉ, especially the carbonates, and the solution of potass. These are, however, much less efficacious than BRANDISH's alkaline solution, which owes much of its efficacy to the lime which it contains. The alkalies should generally be conjoined with tonic or bitter infusions, or decoctions, with chalybeates, as in the mistura ferri composita, or with deobstruent extracts, as taraxacum, guaiacum, sarza, &c.; or they may be given in the form of common or medicated soap, in conjunction with these extracts, or with ammoniacum, myrrh, &c. I have frequently combined either of the carbonates, or the solution of potash, with the iodide of potassium with marked advantage. The aërated alkaline waters may be made the vehicle for several other medicines in the form of tincture; and, when the bowels are lax or irritable, or discharges from any of the mucous canals are troublesome, then lime water, or the aërated lime water taken either alone, or with milk, or with other medicines, which the circumstances of the case will indicate, will be of great service.

182. *H. Acids* have rarely been found of service in scrofulous swellings, although they have often been given in certain states of tuberculosis, especially when affecting the lungs, and sometimes with benefit. I have found, however, the *nitro-hydrochloric acids*, used internally or externally, or in both ways, of great service; and they may be employed either as the chief means, or in aid of other remedies. They are most beneficial when the functions of the liver are imperfectly performed, when the circulation is languid and weak, especially in the extremities, and when the hands or feet are cold. The *hydrochloric* acid was recommended by FERRIAR and JOERDENS, and I have prescribed it in scrofulous affections in the decoction or infusion of cinchona with much advantage. The nitro-hydrochloric acids may be taken either alone or in bitter or tonic infusions.

183. *I. Tonics* of various kinds have been very generally recommended for external scrofulous affections, but not so frequently for internal tuberculosis as rational views of the nature of this malady might have suggested. The preparations of *cinchona* were much employed by WHYTT, FOTHERGILL, NORTHCOTE, and FORDYCE; and various bitter extracts and vegetable tonics by GROSMANN, HUFELAND and others. The connection of scrofulous affections with debility, and with imperfect digestion and assimilation, indicates the necessity of having recourse to this class of medicines either as the principal means of cure, or as adjuvants, or as the vehicles, of other more specific remedies. A solution of *pepsin* has been recommended as a tonic and promoter of digestion by Dr. TYLER SMITH. He gives it a quarter of an hour after every solid meal, and in larger quantity after dinner than at any other time.

184. *K. Cod-liver oil* and the *oil* from the livers of *other species* of the same genus have been recently much employed in the treatment of all forms of scrofula and tuberculosis. I have prescribed it since its use was revived; and I have had numerous occasions of observing its beneficial effects, especially when aided by such means as the peculiarities of the case should suggest. Its operation is not merely that of a nutrient, but it is also alterative, and it certainly produces more or less of a healing influence on ulcerated cavities or surfaces; these effects being the more manifest, the more recent the oil, and the less it is subjected to clarification and other chemical manipulations. I have usually found it most beneficial when taken on the surface of diluted lemon-juice, or on lemonade, or on the surface of the infusion of orange-peel, with or without a few drops of the solution of potash, or of BRANDISH's solution; or on water containing a few drops of the nitro-hydrochloric acids, or of the muriated tincture of iron. When there is much cachexia, or inaction of the liver, or more or less anæmia, these modes of exhibition should be preferred.

185. *L. Burnt Sponge* had once considerable reputation for the cure of scrofula, and to this it was chiefly indebted to ARNAULT DE VILLENEUVE, ASTRUC, LANE, RING, FODÉRÉ, and HUFELAND. I have had no experience of its effects; but that it was entirely without effect I cannot believe, although the quantity of iodine it contains is very minute. The animal charcoal which was thus formed might not have been entirely inefficacious, especially in correcting the contents of the alimentary canal; for which, indeed, powdered *charcoal* is extremely efficacious. LETTSOM, a sagacious practitioner, often had recourse to burnt sponge, and sometimes gave it with calomel.

186. *M. Various substances* have been employed

more or less *empirically*, or without any clear ideas as to their operation, or as to the amount of effect which may be ascribed to them.—(*a.*) Of the benefit which may be derived from *emetics* and *stomachic aperients*, as advised by SCHMIDT, WEIKARD, and others, there can be no doubt, when prescribed at the commencement of the treatment, and when circumstances indicating their use are present. Several other substances were also much employed at different periods, and were probably not altogether without benefit, particularly as alteratives and restoratives, thereby improving the constitutional powers. Amongst these *guaiacum*, *sassafras*, the decoction of *walnut-leaves*, *willow-bark*, *hops*, *taraxacum*, *tussilago*, *cantharides*, *assafœtida*, *&c.*, held the most conspicuous places. RIVERIUS prescribed *gum ammoniacum*, both internally and externally; and I have seen much benefit derived from the *balsam of Peru*; and, in other instances, from *capsicum* taken internally, and from the external application of a weak infusion of it to scrofulous sores. Dr. TYLER SMITH has recently recommended the exhibition of *pepsin* in order to promote the functions of the stomach.

187. (*b.*) *Digitalis* was formerly much employed internally against scrofulous and tubercular diseases. M. BAYLE (*Biblioth. Thérapeutique*, t. iii.) states that it was first prescribed by VAN HELMONT; and subsequently by HALLER and DARWIN, the latter of whom gave the powder in as large doses as five or six grains thrice daily. This substance was used also externally, either in the form of the infusion, or powder of the leaves, and the internal and external uses were conjoined. I have no experience of the remedy in scrofula, and I believe that is more likely to prove injurious than beneficial. The *walnut-leaves* have lately been much recommended by M. NEGRIER; but I agree with Dr. GLOVER in considering them as only slightly beneficial, as a tonic, when the preparations of these leaves are used internally, and as an astringent when applied externally, and as inferior to several other tonics and alteratives usually adopted.

188. (*c.*) At the commencement of the last century *tar-water* was very much vaunted for the cure of every form of scrofula and tuberculosis, and some years ago I prescribed it largely both internally, and externally in a stronger form, as a wash to scrofulous sores; and from my experience of its effects I consider it one of the most efficacious means which we possess, when aided by a suitable diet and regimen. I also gave the pure Norwegian *tar* in the form of pill by means of liquorice powder. Tar may be given more largely when made into pills with magnesia, but in this combination the pills often pass through the bowels without being dissolved. In the more indolent states of scrofulous sores, *creosote* may be substituted for tar-water, but my experience leads me to prefer the latter. The tar may likewise be made into pills with powdered charcoal or other substances, or be taken in gelatine capsules. This medicine is often very efficacious in the chronic cutaneous eruptions which occur in the scrofulous taint or associated with any of the forms of scrofula or tuberculosis.

189. (*d.*) During the 16th and 17th centuries, and more recently, a medicine was much in vogue as an alterative and restorative, not only in scrofula, but also in many other maladies, under the appellation of the *infusion of a thousand flowers*. This consisted of an infusion, either warm or cold, of the recent dung of cows and bullocks feeding in open pastures. The only effect which this medicine could produce must be referred to the proportion of bile which it contained. That *ox-gall* is possessed of much efficacy, either alone, or properly combined, I have shown in various parts of this work, especially in promoting the digestive and assimilating processes. It is readily procured in the states of inspissation and extract. I have prescribed it in the form of pill since 1820, and it is now kept by most of the chemists in this city. It is most beneficially used as an adjunct to other appropriate means, especially in states of inaction of the liver, and when the bowels are weak and irritable.

190. (*e.*) Since the work of STORCK on *Conium* appeared, this substance has had great reputation for the cure of scrofula; and, although it has received the commendations of QUARIN, RUTTY, and many others, I am at a loss to recognise its virtues. The same remark applies to *digitalis*, which has been prescribed by MENZ, DARWIN, and HUFELAND. *Sulphur* in various states of combination is more deserving attention. I have often prescribed it in scrofulous affections, in conjunction with magnesia, powdered cascarilla, or aromatics and warm carminatives, with the view of promoting the cutaneous functions, which are often imperfectly performed, (and this object it attains more permanently than most other means,) and in order to promote the intestinal evacuations. *Camphor* was recommended internally by COPLAND, LETTSOM, and FODÉRÉ, and externally dissolved in olive oil; and in this form it may be applied with gentle friction or more permanently. *Sulphate of zinc* was praised by WHITE, but it is much inferior to the sulphate, or other preparations of iron.

191. (*f.*) *Electricity* was long since recommended by SIGAUD LA FOND for scrofulous swellings, and its use has been recently revived; but in whatever manner this agent may be employed, either as electro-galvanism, or as electro-magnetism, or as shocks from the Leyden jar, or as sparks from the parts affected, it is appropriate only to the more indolent and atonic states, and when the parts furnish no signs of acute inflammatory action.

192. *N. Change of air* to the sea-side, in connection with sea-bathing, &c., has frequently a beneficial influence, and a considerable share of the benefit has been imputed to the sea-air. The amount of benefit has most probably been exaggerated, but I cannot think that it is without influence, especially when the body is duly protected from cold. Mr. PHILLIPS thinks that change to the sea-coast exercises no greater influence on scrofula than change to any inland situation where the air is pure and dry. For young persons and scrofulous children change of air is always beneficial, and when this can be conjoined with the use of sea-water and sea-bathing, I believe the benefit to be augmented; and, for this purpose, especially to residents in the metropolis or other large towns, there are no places more salubrious, during the months of June, July, August, and September, than Lowestoft and its vicinity, and the Isle of Thanet.

193. (*a.*) *Sea and mineral waters* have always had a great reputation in the treatment of scrofulous and tubercular affections. Sea-water has been strongly recommended by RUSSELL, KIRKLAND, TOLBERG, and many others, both internally and externally; and of all waters it is certainly most generally appropriate and efficacious, if its use be judiciously directed. When it can be retained on the stomach, even in small quantity, it will generally be taken internally with benefit; and when the bowels are sluggish it is one of the best aperients that can be given. As a warm, tepid, shower, or cold bath, or used in washing or sponging the surface, it is also an excellent remedy. But when sea-bathing is adopted, especially for children, the period of immersion should be brief—short in proportion to their youth and the amount of debility; and, if alarm be caused by it, the shock should be avoided by substituting effusion on the surface by a sponge, or even by less alarming modes of employing salt-water. In some cases artificial sea-water may be used, or a solution of bay-salt, or this salt may be added to sea-water. Reaction should follow cold bathing, and when this is not manifested, either the period of immersion has been too protracted, or the means is too severe for the constitutional powers of the patient, and should not be persisted in.

194. (*b.*) *Several mineral waters* are used with great benefit, both internally and externally, for scrofulous affections; but they should be prescribed with strict reference to the states of nutrition, circulation, and assimilation, otherwise but little advantage will be derived from them. Where the assimilative functions are much impaired, and more or less of anæmia exists, the chalybeate mineral waters of this country should be preferred; and these may not only be taken internally, but also used externally as baths, as advised by LENTIN and others. The several alkaline and sulphureous waters, as those of Bath, Harrowgate, Leamington, &c., are generally of service, especially when a deobstruent and alterative effect is required. Dr. GLOVER remarks that the mineral waters of Shap and Shotley, in the north of England, appear to be the best suited for scrofula, on account of the large quantity of alkaline and earthy muriates which they contain. Besides these, the mineral springs and the factitious waters of Carlsbad, Ems, Fachingen, Homberg, Kissingen, Seltzer, and of Barèges, Bonnes, Cauterets, Enghien, &c., have severally been recommended in scrofulous affections, and are more or less beneficial when judiciously employed, and aided by suitable medicines, diet, and regimen.

195. *O. Medicated baths* of various kinds have been recommended for external scrofula. Those containing the iodide of iron, or iodide of potassium with the sub-carbonate of potass, or small quantities of the sulphuret of potash, are the most beneficial. I have prescribed baths with the sub-carbonate of potash alone, and believed them to have been of service. It is manifest that these can be viewed merely as aids of internal remedies.

196. *P. The local treatment of scrofula* requires merely a few remarks; for if scrofulous glandular swellings receive an early attention, the internal or constitutional means described above, more especially the administration of the preparations and combinations of iodine, appropriately to the circumstances of the case, should be chiefly confided in. The treatment of scrofulous swellings should depend chiefly on the absence or presence of increased heat and redness. If either or both be present, very different means from those which are indicated when they are absent, are required. As long as the tumour continues devoid of redness, of increased heat, or much tenderness, gentle frictions with fresh olive-oil, to which small proportions of spirits of turpentine and camphor are added, with or without a little soap, will generally be of service. The preparations of iodine, especially ointments, lotions, and tinctures of iodine, have been much employed to the affected parts. But these should be sufficiently mild not to irritate the skin; for when they are too strong, the irritation of the surface caused by them will extend to the parts underneath, and superinduce an inflammation which might not otherwise have occurred. The iodine ointment of the Pharmacopœia is much too strong, and contains too large a proportion of iodine as respects that of the iodide of potassium and that of lard. I have much preferred the ointments prescribed in the APPENDIX (see *Form.* 766—770.); and even they should be cautiously applied, so as to avoid irritation and pain. If the swelling be painful, or if it be irritated by the friction, the compound tincture of iodine may be applied, more or less diluted, to the surface, or the lotions prescribed in the APPENDIX may be employed (see *Form.* 671—673.), but the stronger of these should be very much diluted.

197. When inflammatory action appears, either in the surface of the swelling or in the subjacent parts, the more common applications for sthenic inflammation are seldom of service, but, on the contrary, are often prejudicial. The existence o pain in the swollen part should not be viewed as always indicative of inflammation, for where the former is most severe, the latter may not be present. In these cases, the *unguentum iodinii plumbi*, and the *unguentum iodinii opiatum*, in the APPENDIX (*Form.* 768. 770.), are the most serviceable. I have also found the *unguent. calomelanos cum camphorâ* (*Form.* 757.) of use. These ointments should be rubbed gently over the surface, without exciting irritation. If increased heat and redness continue nevertheless, warm and anodyne applications are frequently more beneficial. In these cases, either of the deobstruent ointments in the APPENDIX (*Form.* 761, 762.) may be tried, as there prescribed or more or less diluted.

198. If the inflamed part goes on to *suppuration*, an early outlet should be given to the matter, as its retention contaminates the tissues which surround it, and, extending in more than one direction, often gives rise to sinuses. The *ulceration* consequent on scrofulous suppuration generally requires not only much attention to the general health, by the means above described, but also a pure air, and suitable diet and regimen. In addition to these, gently stimulating applications, consisting either of very weak iodureted ointments or lotions,—of ointments containing either the balsam of Peru or a small proportion of the iodide of zinc,—of lotions containing a few drops of the tincture of capsicum, or of one of the chlorides,—will be used with benefit. The solutions of iodine recommended by LUGOL to scrofulous ulcers are the following:—

	No. 1.	No. 2.	No. 3.
Iodine	2 grs.	3 grs.	4 grs.
Iodide of Potass.	4 grs.	6 grs.	8 grs.
Distilled water	1 pound	1 pound	1 pound

These, commencing with the weakest, may be used frequently, either as washes or lotions, or be injected into scrofulous sinuses.

199. Q. *The diet and regimen* of scrofulous and tubercular subjects, whether *infants, children*, or *adults*, are in every respect the same as above recommended (§§ 148—153.) for the *preventiom and the hygeienic treatment of scrofula and tuberculosis.* The chief of these means are animal warmth and suitable food during infancy; a pure, dry, moderately warm and uncontaminated atmosphere; due ventilation of the apartments, especially of bedrooms; change of air, sea-air, and voyaging; a due regulation and subjugation of the passions, desires, and imagination; a light, digestible, and nutritious diet, avoiding stimulants or heating beverages; and regular exercise in the open air; due exposure to light and sunshine; early and regular hours for sleeping and waking, and for meals; and attention to the states of all the secretions and excretions,—the cutaneous, intestinal, and urinary,—are the most conducive, not merely to the prevention of scrofula and tuberculosis, but also to the recovery of health in all the forms in which these states of disease manifest themselves.

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END OF PART I. VOL. III.